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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/775,706	10/20/2020	10806124	374-2	3566

90741 7590 09/30/2020

Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

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 111 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 Data Management (ODM) at (571)-272-4200.

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

Ramin Karimpour, Raleigh, NC;
Applied LifeSciences and Systems, LLC, Raleigh, NEW CALEDONIA

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PTO/SB/08a (07-09)
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 3

Complete if Known	
Application Number	15775706
Filing Date	May 11, 2018
First Named Inventor	Karimpour, Ramin
Art Unit	
Examiner Name	
Attorney Docket Number	374-2

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
/D.P/		US-3994292	11-30-1976	Goodwin	Col. 2, lines 18-46
/D.P/		US-5101767	04-07-1992	Williams et al.	Col.2,line 48-Col.3,line 21
/D.P/		US-5626101	05-06-1997	Kuhl	Figs. 1&3; Col. 6, lines 7-19
/D.P/		US-7004112 02-2006	~~05-12-2005~~	Gorans	Col.12,lines18-48;
		US-			Col. 13, lines 42-67;
		US-			Col. 14, lines 1-3
/D.P/		US-7066112 06-2006	~~06-09-2005~~	Gorans	Col. 12, line 40-Col.14 line 7
/D.P/		US-7367284 05-2008	~~09-01-2006~~	Gorans	Col. 12,line 30-Col. 3 line 60
/D.P/		US-8019125 09-2011	~~01-09-2009~~	Nadreau et al.	Col. 5, line 56-Col. 6, line 9
/D.P/		US-8297231 10-2012	~~08-05-2010~~	Yanai et al.	Col 11, lines 33-67
/D.P/		US-8677941 03-2014	~~01-03-2013~~	Yanai et al.	Col. 11, lines 31-65
		~~US-20100019802~~	~~08-05-2010~~	~~Elazari-Volcani et al.~~	~~Para. 0135-0139~~
/D.P/		US-20130125835	05-23-2013	Sinn et al.	Para. 0037
/D.P/		US-4417663	11-29-1983	Suzuki	Col. 4, line 54-Col. 5 line 9
/D.P/		US-6029080	02-22-2000	Reynnels et al.	
/D.P/		US-6396938	05-28-2002	Tao et al.	Col. 5, line 26-Col. 5 line 9
/D.P/		US-6512839	01-28-2003	Toelken	Col. 5, lines 9-25
/D.P/		US-8019125 09-2011	~~01-01-2009~~	Nadreau et al.	Col. 7,line 16-Col. 8 line 21
/D.P/		US-9179651 11-2015	~~03-13-2014~~	McKay	

Change(s) applied to document, /G.R.P/ 9/17/2020

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]

Examiner Signature	/DOV POPOVICI/	Date Considered	10/29/2019

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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 2 hours 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, 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.**

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(Use as many sheets as necessary)

Sheet 2 of 3

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Filing Date	May 11, 2018
First Named Inventor	Karimpour, Ramin
Art Unit	
Examiner Name	
Attorney Docket Number	

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/D.P/		US- 20010035370	11-1-2001	Yavnai et al.	Para.0037-0039, 0042-0043
/D.P/		US- 20050098121	05-12-2005	Gorans et al.	Para. 03, 14, 16, 38, 82-83
/D.P/		US- 20150289478	10-15-2015	~~Animal Biotech LLC~~McGlone et al.	Para. 59, 71, 83-84,217, 228
/D.P/		US- 20090000915	01-01-2009	Nadreau	all
/D.P/		US- 20140069336	03-13-2014	McKay	all
/D.P/		US- 20140155756	06-05-2014	~~Faunus Ltd.~~ Elazari-Volcani	all
		US-			
		US-			
		US- Change(s) applied			
		US- to document,			
		US- /G.R.P./			
		US- 9/17/2020			
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/D.P/		EP 2579188	10-04-2013	Weekers	Par13,17,19,22,27-28	
/D.P/		WO/2014/118788A2	08-07-2014	Faunus Ltf.	Page 11,line 16-21;	
					Page 44,line 26-32;	
					P 59,lines 5-6,23-26	

Examiner Signature	/DOV POPOVICI/	Date Considered	10/29/2019

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/775,706	05/11/2018	Ramin Karimpour	374-2	3566

90741 7590 09/23/2020

Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518

EXAMINER	
POPOVICI, DOV	

ART UNIT	PAPER NUMBER
2677	

NOTIFICATION DATE	DELIVERY MODE
09/23/2020	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):

klynch@kliplaw.com
kml@lynchvansickle.com
lynchbunch@kliplaw.com

Corrected ***Notice of Allowability***	**Application No.** 15/775,706	**Applicant(s)** Karimpour, Ramin	
	Examiner DOV POPOVICI	**Art Unit** 2677	**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 filed on 18 September 2020.
   ☐ 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 See Continuation Sheet . 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. 20200918.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/DOV POPOVICI/
Primary Examiner, Art Unit 2677

Continuation of 3. The allowed claim(s) is/are: 1-3, 9-10, 14, 21 and 24-34, renumbered as claims 1-18

Examiner-Initiated Interview Summary	**Application No.** 15/775,706	**Applicant(s)** Karimpour, Ramin	
	Examiner DOV POPOVICI	**Art Unit** 2677	**AIA (FITF) Status** Yes

All participants (applicant, applicant's representative, PTO personnel):

(1) DOV POPOVICI. (3) _____.

(2) Kathleen M. Lynch (Reg. No. 33,957). (4) _____.

Date of Interview: 18 September 2020.

Type: ☑ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☐ No.
If Yes, brief description: _____.

Issues Discussed ☐ 101 ☐ 112 ☐ 102 ☐ 103 ☑ Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: None.

Identification of prior art discussed: None.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Examiner Popovici requested that the IDS dated 10/18/2018 (sheet 3 of 3) listing the Non Patent Literature Documents, GERSHMAN, Y. and GUY, TM et al. which are truncated at the bottom of each reference cited, be provided and supplied again via a new IDS which applicant did file on 9/18/2020, see the attached IDS dated 09/18 /2020..

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

	/DOV POPOVICI/ Primary Examiner, Art Unit 2677

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	15/775,706
Filing Date	May 11, 2018
First Named Inventor	Karimpour, R.
Art Unit	2677
Examiner Name	D. Popovici
Attorney Docket Number	374-2

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
/D.P/	1	GERSHMAN, Y., "A Simple Way to Determine the Sex of One-Day Poultry Chickens"; The Papers of Independent Authors [online]; Vol. 28, DNA	
/D.P/		2014, [https://vixra.org/pdf/1405.0016v1.pdf]	
/D.P/	2	N.T. GUY, ET AL., "Development of Epileptic Activity in Embryos and Newly Hatched Chicks of the Fayomi Mutant Chicken"; Epilepsia, Vol. 36,	
/D.P/		No. 1, Jan. 1995 [https://pubmed.ncbi.nlm.nih.gov/8001501/]	

Examiner Signature	/DOV POPOVICI/	Date Considered	09/18/2020

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

[1] Applicant's unique citation designation number (optional). [2] Applicant is to place a check mark here if English language Translation is attached.

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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.

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NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	1	GERSHMAN, Y., "A Simple Way to Determine the Sex of One-Day Poultry Chickens"; The Papers of Independent Authors [online]; Vol. 28, DNA	
		2014, [https://vixra.org/pdf/1405.0016v1.pdf]	
	2	N.T. GUY, ET AL., "Development of Epileptic Activity in Embryos and Newly Hatched Chicks of the Fayomi Mutant Chicken"; Epilepsia, Vol. 36,	
		No. 1, Jan. 1995 [https://pubmed.ncbi.nlm.nih.gov/8001501/]	

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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.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Ramin Karimpour
Serial No.:	15/775,706
Title:	System and Method for Determining the Health and Gender of a Chick
Examiner:	D. Popovici
Group Art Unit:	2677

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

TRANSMITTAL OF SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Dear Sir:

This is in response to a telephone conversation with Examiner Popovici on September 18, 2020. Examiner Popovici received a notice from the publication department at the Patent Office stating that the Supplemental Information Disclosure Statement filed by Applicant on October 18, 2018 is not completely legible. In particular, on page 3 of 3 in the Non-Patent Literature Document section, information regarding both entries is cut off and the third line in each entry is illegible. Applicant submits herewith a Second Supplemental Information Disclosure Statement of both Non-Patent Literature references. Applicant has spaced out the information onto two entry sections for the purpose of providing sufficient visibility of all information.

Should the Examiner have any further questions or require any further information, he is invited to contact the undersigned by telephone or email at his convenience.

Respectfully submitted,

Kathleen M. Lynch
Reg. No. 33957

Date: September 18, 2020

Law Office of Kathleen Lynch, PLLC
104 Bronzewood Court
Cary, NC 27518
klynch@klplaw.com
(919) 696-8659

Electronic Acknowledgement Receipt	
EFS ID:	40600975
Application Number:	15775706
International Application Number:	
Confirmation Number:	3566
Title of Invention:	System and Method of Determining the Health and Gender of a Chick
First Named Inventor/Applicant Name:	Ramin Karimpour
Customer Number:	90741
Filer:	Kathleen Maher Lynch
Filer Authorized By:	
Attorney Docket Number:	374-2
Receipt Date:	18-SEP-2020
Filing Date:	11-MAY-2018
Time Stamp:	14:26:56
Application Type:	U.S. National Stage under 35 USC 371

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	Information Disclosure Statement (IDS) Form (SB08)	SuppIDS20200918.pdf	199199 9f18b766ba3d3fce8408e25069899cc09ba21e0b	no	2

Warnings:

Information:					
This is not an USPTO supplied IDS fillable form					
2	Transmittal Letter	xmital2dSupplDS20200918.pdf	571668 46627e9ce92b7dd0c8e566dad5b0cf8a27b33385	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	770867	

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 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.

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.

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.
15/775,706	05/11/2018	Ramin Karimpour	374-2	3566

90741 7590 06/23/2020

Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518

EXAMINER	
POPOVICI, DOV	

ART UNIT	PAPER NUMBER
2677	

NOTIFICATION DATE	DELIVERY MODE
06/23/2020	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):

klynch@kliplaw.com
kml@lynchvansickle.com
lynchbunch@kliplaw.com

Corrected ***Notice of Allowability***	**Application No.** 15/775,706	**Applicant(s)** Karimpour, Ramin	
	Examiner DOV POPOVICI	**Art Unit** 2677	**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 the IDS filed on 04 June 2020 and 16 June 2020.
   ☐ 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 1-3, 9-10, 14, 21 and 24-34, renumbered as claims 1-18 . 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 _____.

/DOV POPOVICI/
Primary Examiner, Art Unit 2677

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. 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	15775706
	Filing Date	2018-05-11
	First Named Inventor	Ramin KARIMPOUR
	Art Unit	2677
	Examiner Name	POPOVICI, DOV
	Attorney Docket Number	374-2 / 673-06-UTIL

U.S.PATENTS						
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
/D.P/	1	4850997	A1	1989-07-25	Ronald DuBose	
/D.P/	2	4449968	A1	1984-05-22	Walter L. Peterson	
/D.P/	3	8397670	B2	2013-03-19	Karel Van Den Berg	
/D.P/	4	6396938	B1	2002-05-28	Yang Tao, et al.	
If you wish to add additional U.S. Patent citation information please click the Add button.						
U.S.PATENT APPLICATION PUBLICATIONS						
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
/D.P/	1	20100310589	A1	2010-12-09	Mahesh Kumar	
/D.P/	2	20150320010	A1	2015-11-12	Martinus Pancratius Maria Schippers	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.P/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	First Named Inventor	Ramin KARIMPOUR
	Art Unit	2677
	Examiner Name	POPOVICI, DOV
	Attorney Docket Number	374-2 / 673-06-UTIL

/D.P/	3	20010035370	A1	2001-11-01	Amotz Yavnai, et al.	
/D.P/	4	20090000915	A1	2009-01-01	Michael Nadreau, et al.	

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

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	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]
/D.P/	1	2012008843	WO	A1	2012-01-19	MASKON AS		☐
/D.P/	2	2015112786	WO	A1	2015-07-30	OPHTHY-DS		☐

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]
/D.P/	1	Office Action issued by Federal Service for Intellectual Property (Russia) against Application No. 2018117356/10 (027024) on March 4, 2020.	☐
/D.P/	2	English translation of Office Action issued by Federal Service for Intellectual Property (Russia) against Application No. 2018117356/10(027024) on March 4, 2020.	☐
/D.P/	3	Substantive Examination Report issued by Directorate General of Intellectual Property (Indonesia) against Application No. PID201804018 on May 27, 2020.	☐

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.P/

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	Attorney Docket Number	374-2 / 673-06-UTIL

/D.P/	4	English summary, dated June 3, 2020, of Substantive Examination Report issued by Directorate General of Intellectual Property (Indonesia) against Application No. PID201804018 on May 27, 2020.	☐
/D.P/	5	Communication pursuant to Article 94(3) EPC from the European Patent Office against Application No. 16865084.4-1011 issued March 12, 2020.	☐

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

EXAMINER SIGNATURE

Examiner Signature	/DOV POPOVICI/	Date Considered	06/18/2020

*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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.P/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	First Named Inventor	Ramin KARIMPOUR
	Art Unit	2677
	Examiner Name	POPOVICI, DOV
	Attorney Docket Number	374-2 / 673-06-UTIL

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	/Kathleen M. Lynch/	Date (YYYY-MM-DD)	2020-06-04
Name/Print	Kathleen M. Lynch	Registration Number	33957

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.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.P/

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.

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.P/

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. 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	15775706
	Filing Date	2018-05-11
	First Named Inventor	Ramin KARIMPOUR
	Art Unit	2677
	Examiner Name	POPOVICI, DOV
	Attorney Docket Number	374-2 / 673-06-UTIL

U.S.PATENTS						
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
/D.P/	1	4850997	A1	1989-07-25	Ronald DuBose	
/D.P/	2	4449968	A1	1984-05-22	Walter L. Peterson	
/D.P/	3	8397670	B2	2013-03-19	Karel Van Den Berg	
/D.P/	4	6396938	B1	2002-05-28	Yang Tao, et al.	
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U.S.PATENT APPLICATION PUBLICATIONS						
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
/D.P/	1	20100310589	A1	2010-12-09	Mahesh Kumar	
/D.P/	2	20150320010	A1	2015-11-12	Martinus Pancratius Maria Schippers	

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	Attorney Docket Number	374-2 / 673-06-UTIL

/D.P/	3	20010035370	A1	2001-11-01	Amotz Yavnai, et al.	
/D.P/	4	20090000915	A1	2009-01-01	Michael Nadreau, et al.	

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

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	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]
/D.P/	1	2012008843	WO	A1	2012-01-19	MASKON AS		☐
/D.P/	2	2015112786	WO	A1	2015-07-30	OPHTHY-DS		☐

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]
/D.P/	1	Office Action issued by Federal Service for Intellectual Property (Russia) against Application No. 2018117356/10 (027024) on March 4, 2020.	☐
/D.P/	2	English translation of Office Action issued by Federal Service for Intellectual Property (Russia) against Application No. 2018117356/10(027024) on March 4, 2020.	☐
/D.P/	3	Substantive Examination Report issued by Directorate General of Intellectual Property (Indonesia) against Application No. PID201804018 on May 27, 2020.	☐

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/D.P/	5	Communication pursuant to Article 94(3) EPC from the European Patent Office against Application No. 16865084.4-1011 issued March 12, 2020.	☐

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

EXAMINER SIGNATURE

Examiner Signature	/DOV POPOVICI/	Date Considered	06/18/2020

*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.

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	Attorney Docket Number	374-2 / 673-06-UTIL

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	/Kathleen M. Lynch/	Date (YYYY-MM-DD)	2020-06-04
Name/Print	Kathleen M. Lynch	Registration Number	33957

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.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.P/

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 record s.

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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.P/

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.
15/775,706	05/11/2018	Ramin Karimpour	374-2	3566

90741 7590 06/22/2020

Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518

EXAMINER	
POPOVICI, DOV	

ART UNIT	PAPER NUMBER
2677	

NOTIFICATION DATE	DELIVERY MODE
06/22/2020	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):

klynch@kliplaw.com
kml@lynchvansickle.com
lynchbunch@kliplaw.com

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

In re Application of	:	
Karimpour, Ramin	:	
Application No. 15/775,706	:	DECISION ON PETITION
Filed: 11 May 2018	:	
For: System and Method of Determining the	:	
Health and Gender of a Chick	:	

This is a decision on the petition under 37 CFR 1.313(c), filed June 16, 2020, to withdraw the above-identified application from issue after payment of the issue fee.

The petition is **DISMISSED**.

37 CFR 1.313(c) provides that:

> Once the issue fee has been paid, the application will not be withdrawn from issue upon petition by the applicant for any reason except:
>
> > (1) Unpatentability of one of more claims, which petition must be accompanied by an unequivocal statement that one or more claims are unpatentable, an amendment to such claim or claims, and an explanation as to how the amendment causes such claim or claims to be patentable;
> > (2) Consideration of a request for continued examination in compliance with 37 CFR 1.114; or
> > (3) Express abandonment of the application. Such express abandonment may be in favor of a continuing application.

Upon payment of the issue fee, an application will not be withdrawn from issue upon petition except for the reasons enumerated in 37 CFR 1.313(c). The circumstances of the above-identified application do not fall within any of those exceptions.

For the reason stated above, the petition under 37 CFR 1.313(c) cannot be granted.

Petitioner is reminded that the filing of any renewed petition to withdraw from issue may not be recognized or effective if not received by the appropriate deciding official in time to act prior to issuance. *Note* 37 CFR 1.313(d). It is recommended that the facsimile number listed below be used to file the renewed petition.

Further correspondence with respect to this matter should be addressed as follows:

By mail: Mail Stop PETITIONS

Commissioner for Patents
Post Office Box 1450
Alexandria, VA 22313-1450

By hand: Customer Service Window
Mail Stop Petitions
Randolph Building
401 Dulany Street
Alexandria, VA 22314

By fax: **(571) 273-0025**
Office of Petitions

Telephone inquiries should be directed to the undersigned at (571) 272-3206.

/LIANA S WALSH/
Lead Paralegal Specialist, OPET

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re United States Patent Application of:		**Docket No.:**	**673-06-UTIL**
Applicant(s):	**Ramin Karimpour**	**Confirmation No.:**	**3566**
Application No.:	**15/775,706**	**Examiner:**	**POPOVICI, DOV**
Filing Date	**May 11, 2018**	**Art Unit:**	**2677**
Title:	**SYSTEM AND METHOD OF DETERMING THE HEALTH AND GENDER OF A CHICK**		

PETITION FOR WITHDRAWAL FROM ISSUE UNDER 37 C.F.R. §1.313(c)(2)

Mail Stop: Office of Petitions
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

It is respectfully requested that the Examiner withdraw the present application from issue in order to comply to the Notice of Non-Compliant Information Disclosure Statement that issued on June 10, 2020. Please find enclosed herewith a copy of the Information Disclosure Statement originally filed on June 4, 2020 including the fee set forth in §1.17(p). The necessity of this petition relates to the references that were cited in corresponding foreign applications and would like to have these references considered by the Patent Office.

It is requested that this Petition be allowed and the Information Disclosure Statement be considered, and the application be allowed to pass to issue.

The Petition Fee and Information Disclosure fee is being paid herewith by electronic transfer. The Commissioner is hereby authorized to charge any additional fees found due to Deposit Account No. 50-5046.

Respectfully submitted

Date: June 16, 2020

/Kathleen M. Lynch/

Kathleen M. Lynch
Reg. No. 33,957
Attorney for Applicants

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. 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	15775706
	Filing Date	2018-05-11
	First Named Inventor	Ramin KARIMPOUR
	Art Unit	2677
	Examiner Name	POPOVICI, DOV
	Attorney Docket Number	374-2 / 673-06-UTIL

U.S.PATENTS						
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	4850997	A1	1989-07-25	Ronald DuBose	
	2	4449968	A1	1984-05-22	Walter L. Peterson	
	3	8397670	B2	2013-03-19	Karel Van Den Berg	
	4	6396938	B1	2002-05-28	Yang Tao, et al.	
If you wish to add additional U.S. Patent citation information please click the Add button.						
U.S.PATENT APPLICATION PUBLICATIONS						
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	20100310589	A1	2010-12-09	Mahesh Kumar	
	2	20150320010	A1	2015-11-12	Martinus Pancratius Maria Schippers	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15775706
	Filing Date	2018-05-11
	First Named Inventor	Ramin KARIMPOUR
	Art Unit	2677
	Examiner Name	POPOVICI, DOV
	Attorney Docket Number	374-2 / 673-06-UTIL

	3	20010035370	A1	2001-11-01	Amotz Yavnai, et al.	
	4	20090000915	A1	2009-01-01	Michael Nadreau, et al.	

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

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	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	2012008843	WO	A1	2012-01-19	MASKON AS		☐
	2	2015112786	WO	A1	2015-07-30	OPHTHY-DS		☐

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	Office Action issued by Federal Service for Intellectual Property (Russia) against Application No. 2018117356/10 (027024) on March 4, 2020.	☐
	2	English translation of Office Action issued by Federal Service for Intellectual Property (Russia) against Application No. 2018117356/10(027024) on March 4, 2020.	☐
	3	Substantive Examination Report issued by Directorate General of Intellectual Property (Indonesia) against Application No. PID201804018 on May 27, 2020.	☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15775706
	Filing Date	2018-05-11
	First Named Inventor	Ramin KARIMPOUR
	Art Unit	2677
	Examiner Name	POPOVICI, DOV
	Attorney Docket Number	374-2 / 673-06-UTIL

	4	English summary, dated June 3, 2020, of Substantive Examination Report issued by Directorate General of Intellectual Property (Indonesia) against Application No. PID201804018 on May 27, 2020.	☐
	5	Communication pursuant to Article 94(3) EPC from the European Patent Office against Application No. 16865084.4-1011 issued March 12, 2020.	☐

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

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*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	15775706
	Filing Date	2018-05-11
	First Named Inventor	Ramin KARIMPOUR
	Art Unit	2677
	Examiner Name	POPOVICI, DOV
	Attorney Docket Number	374-2 / 673-06-UTIL

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OR

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☐ 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	/Kathleen M. Lynch/	Date (YYYY-MM-DD)	2020-06-04
Name/Print	Kathleen M. Lynch	Registration Number	33957

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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.

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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:	15775706
Filing Date:	11-May-2018
Title of Invention:	System and Method of Determining the Health and Gender of a Chick
First Named Inventor/Applicant Name:	Ramin Karimpour
Filer:	Kathleen M. Lynch/Serita Evans
Attorney Docket Number:	374-2

Filed as Small Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
PETITION FEE-37CFR 1.17(H) (GROUP II)	2464	1	70	70
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	2806	1	120	120
		Total in USD ($)		**190**

Electronic Acknowledgement Receipt	
EFS ID:	39736219
Application Number:	15775706
International Application Number:	
Confirmation Number:	3566
Title of Invention:	System and Method of Determining the Health and Gender of a Chick
First Named Inventor/Applicant Name:	Ramin Karimpour
Customer Number:	90741
Filer:	Kathleen M. Lynch/Serita Evans
Filer Authorized By:	Kathleen M. Lynch
Attorney Docket Number:	374-2
Receipt Date:	16-JUN-2020
Filing Date:	11-MAY-2018
Time Stamp:	16:29:54
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$190
RAM confirmation Number	E20206FG31339619
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	Petition to Withdraw from Issue	673-06-UTIL_2020-06-16_Petition_to_Withdraw_from_Issue.pdf	28694 77960c9f5df5a1accf6ef2507b71ab455c450555	no	2
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	673-06-UTIL_2020-06-04_IDSklex.pdf	68055 34fc8fb29c9ffd8d1abf4cc0cf4d341a0a2faca1	no	5
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Fee Worksheet (SB06)	fee-info.pdf	32464 a5d7634785e0000de894ec35cbd988a5e9de2b13	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	129213		

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 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.

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.

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.
15/775,706	05/11/2018	Ramin Karimpour	374-2	3566

7590 06/10/2020

Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518

EXAMINER	
POPOVICI, DOV	
ART UNIT	PAPER NUMBER
2677	
NOTIFICATION DATE	DELIVERY MODE
06/10/2020	ELECTRONIC

NOTICE OF NON-COMPLIANT INFORMATION DISCLOSURE STATEMENT

An Information Disclosure Statement (IDS) filed 06/04/2020 in the above-identified application fails to meet the requirements of 37 CFR 1.97(d) for the reason(s) specified below. Accordingly, the IDS will be placed in the file, but the information referred to therein has not been considered.

The IDS is not compliant with 37 CFR 1.97(d) because:

☐ The IDS lacks a statement as specified in 37 CFR 1.97(e).

☒ The IDS lacks the fee set forth in 37 CFR 1.17(p).

☐ The IDS was filed after the issue fee was paid. Applicant may wish to consider filing a petition to withdraw the application from issue under 37 CFR 1.313(c) to have the IDS considered. See MPEP 1308.

/BC/
571-272-4200 or 1-888-786-0101
Application Assistance Unit
Office of Data Management

FORM PTOM327-B (Rev. 02/08)

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)

90274 2560 03/06/2020

Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518

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.

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.
15/775,706	05/11/2018	Ramin Karimpour	374-2	3566

TITLE OF INVENTION: System and Method of Determining the Health and Grader of a Check

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	06/08/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
PORDOCI, DOV	3677	382-110000

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/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 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,
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1 Kathleen M. Lynch
2 Olive Law Group, PLLC
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: Applied LifeSciences and Systems, LLC

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Raleigh, N.C.

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

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

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☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

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Authorized Signature: Kathleen Lynch Date: 6/5/2020

Typed or printed name: Kathleen Lynch Registration No.: 33,957

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Electronic Patent Application Fee Transmittal

Application Number:	15775706
Filing Date:	11-May-2018
Title of Invention:	System and Method of Determining the Health and Gender of a Chick
First Named Inventor/Applicant Name:	Ramin Karimpour
Filer:	Kathleen M. Lynch/Serita Evans
Attorney Docket Number:	374-2

Filed as Small Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	2501	1	500	500

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**500**

Electronic Acknowledgement Receipt	
EFS ID:	39644809
Application Number:	15775706
International Application Number:	
Confirmation Number:	3566
Title of Invention:	System and Method of Determining the Health and Gender of a Chick
First Named Inventor/Applicant Name:	Ramin Karimpour
Customer Number:	90741
Filer:	Kathleen M. Lynch/Serita Evans
Filer Authorized By:	Kathleen M. Lynch
Attorney Docket Number:	374-2
Receipt Date:	05-JUN-2020
Filing Date:	11-MAY-2018
Time Stamp:	17:33:11
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$500
RAM confirmation Number	E202065H34495849
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	673-06-UTIL_2020-06-05_Issue_Fee_Transmittl.pdf	732166 ec41aba09877d7755ba40a6f2feb0329f6fce190	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30398 5458bdcb6fc670c96a86e4c7f7ea74080915586a	no	2
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PTO/SB/08a (02-18)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15775706
	Filing Date	2018-05-11
	First Named Inventor	Ramin KARIMPOUR
	Art Unit	2677
	Examiner Name	POPOVICI, DOV
	Attorney Docket Number	374-2 / 673-06-UTIL

U.S.PATENTS						
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	4850997	A1	1989-07-25	Ronald DuBose	
	2	4449968	A1	1984-05-22	Walter L. Peterson	
	3	8397670	B2	2013-03-19	Karel Van Den Berg	
	4	6396938	B1	2002-05-28	Yang Tao, et al.	
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U.S.PATENT APPLICATION PUBLICATIONS						
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	20100310589	A1	2010-12-09	Mahesh Kumar	
	2	20150320010	A1	2015-11-12	Martinus Pancratius Maria Schippers	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15775706
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	First Named Inventor	Ramin KARIMPOUR
	Art Unit	2677
	Examiner Name	POPOVICI, DOV
	Attorney Docket Number	374-2 / 673-06-UTIL

	3	20010035370	A1	2001-11-01	Amotz Yavnai, et al.	
	4	20090000915	A1	2009-01-01	Michael Nadreau, et al.	

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FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	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	2012008843	WO	A1	2012-01-19	MASKON AS		☐
	2	2015112786	WO	A1	2015-07-30	OPHTHY-DS		☐

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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	Office Action issued by Federal Service for Intellectual Property (Russia) against Application No. 2018117356/10 (027024) on March 4, 2020.	☐
	2	English translation of Office Action issued by Federal Service for Intellectual Property (Russia) against Application No. 2018117356/10(027024) on March 4, 2020.	☐
	3	Substantive Examination Report issued by Directorate General of Intellectual Property (Indonesia) against Application No. PID201804018 on May 27, 2020.	☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15775706
	Filing Date	2018-05-11
	First Named Inventor	Ramin KARIMPOUR
	Art Unit	2677
	Examiner Name	POPOVICI, DOV
	Attorney Docket Number	374-2 / 673-06-UTIL

	4	English summary, dated June 3, 2020, of Substantive Examination Report issued by Directorate General of Intellectual Property (Indonesia) against Application No. PID201804018 on May 27, 2020.	☐
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15775706
	Filing Date	2018-05-11
	First Named Inventor	Ramin KARIMPOUR
	Art Unit	2677
	Examiner Name	POPOVICI, DOV
	Attorney Docket Number	374-2 / 673-06-UTIL

CERTIFICATION STATEMENT

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

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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	/Kathleen M. Lynch/	Date (YYYY-MM-DD)	2020-06-04
Name/Print	Kathleen M. Lynch	Registration Number	33957

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(19) World Intellectual Property Organization
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(74) Agent: **CURO AS**; Industriveien 53, N-7080 Heimdal (NO).

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

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[Continued on next page]

(54) Title: METHOD AND SYSTEM FOR VACCINATING AND SORTING FISH

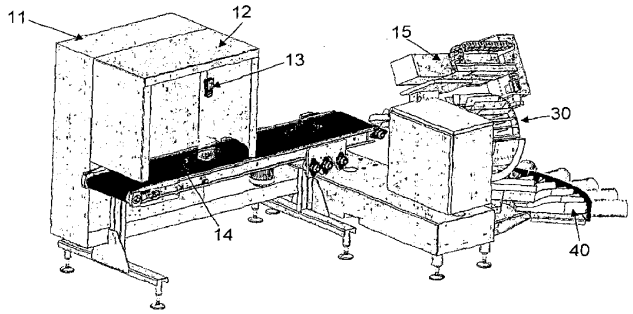


Figure 1.

(57) Abstract: Method and system for recognizing, vaccinating, sorting and documenting alive fish. The system includes a control unit (11), means (12) for acquiring information about fish, transportation means (14) to transport fish past means (12) for acquiring information about fish, and means (15) for vaccinating the individual fish. The system is arranged for detecting/recognizing one or more of the following parameters of the individual fish: I. length of the fish(fork length), II. height of the fish, III. thickness of the fish, and based on this information: - instruct means (40, 41, 42) for sorting fish to sort out unwanted fish prior to vaccination, or - instruct means (15) for vaccinating fish, and instructing means (40, 41, 42) for sorting fish after vaccination or sorting out untreated fish.

WO 2012/008843 A1

Published:

— *with international search report (Art. 21(3))*

Method and system for vaccinating and sorting fish

The present invention is related to a method for vaccinating and sorting fish, according to the preamble of claim 1.

The present invention also relates to a system for vaccinating and sorting fish, according to the preamble of claim 15.

Background

Today vaccination is either performed completely manually or in semi-automatic vaccination machines. Operators inject the vaccine into each individual fish by means of a vaccination syringe or feeds fish by fish into a semi-automatic vaccination machine. Today it is most common to sort the fish prior to vaccination. The sorting improves and provides increased quality of the work performed, i.e. the vaccination. At pure manual vaccination and most of the semi-automatic vaccination machines, there is a need for a fixed dosing depth. Based on the size of the fish to be vaccinated the correct needle lengths are selected and injection points in the longitudinal direction are adjusted manually. As a result, the size of the fish which is to be vaccinated must be within a fixed size interval for correct deposition of vaccine.

Some of the semi-automatic machines have sensors which measure length and color nuance. By length registration injection point in longitudinal direction is determined, and a fixed injection depth (mechanical) which is dependent of the length of the fish. In addition it is registered if the fish is positioned correct (abdomen upside/down) prior to vaccination, by means of color sensors. Sorting is based on the length of the fish.

From NO 320008 describes a method for automatic injection of a composition in alive fish. The fish is fed forward by a conveyor located in compartments wherein each fish is oriented transversely to the feeding direction. Each fish is measured with regard to size, and an injection unit is adjusted for each measured fish for positioning against an injection position toward the fish, dependent on the measured size of the fish. The injection is performed through an injection movement to a selected injection depth by means of a needle at the selected injection point on each conveyed fish and supply of a composition via a needle.

NO 172831 describes an apparatus for separate handing of alive fish comprising a number of supporting means arranged radially onto a rotary table which is arranged on a table of stainless steel, on which a pool for fish is arranged, having a gutter, a vaccination apparatus and a control cabinet. By turning the rotary table, fish in the respective support is moved to different positions. The bottom of each support can be opened so that the fish is released and through a outlet pipe is guided to a pool of water.

The disadvantage of determining injection point, injection depth and sorting only by means of one parameter (the length of the fish) is reduced accuracy. It is also difficult to evaluate if a fish is injured by means of only length sensors/color sensors.

Object

The main object of the invention is to provide a method and a system of vaccinating fish.

It is further an object of the present invention to be able to document the fish, e.g. from fork length, height, injuries, biomass etc., and based on this information find and determine injection point coordinates for vaccination, including injection depth.

It is further an object of the present invention to provide a method and a system which in addition to vaccination is arranged for sorting out unwanted fish prior to vaccination, e.g. because of injuries, deviations, wrongly oriented fish etc., including sorting of fish after vaccination has been performed, e.g. sorting by size, length, height etc.

It is further an object of the present invention to provide a method and a system which in addition to vaccination is arranged for quality control of fish prior to vaccination, including quality control of fish prior to vaccination to avoid wrong treatment, such as dosage in the back at vaccination.

The invention

A method according to the invention is described in claim 1. Preferable features of the method are described in claims 2-14.

A system according to the invention is described in claim 15. Preferable features of the system are described in claims 16-31.

A system according to the invention includes a control unit, means for acquiring information about fish. Means for acquiring information about fish is e.g. a unit for illumination and camera recognition including one or more cameras. Moreover, the system includes specially formed transportation means for transporting fish past the means for acquiring information about fish for performing an analysis of the fish, preferably image analysis. The transportation means are for example a conveyor belt designed especially with regard to image recognition.

Moreover, the system according to the invention includes one or more means for vaccinating fish, e.g. in the form of an injection and dosage unit. Moreover, the system preferably includes means to ensure that each fish is being vaccinated separately, said means being arranged longitudinally with regard to the transportation means. Means for ensuring separate vaccination

of fish are preferably arranged to bring the fish to a vaccination position for engagement of the means for vaccinating fish.

Preferably, the system includes means for supply of fish to the transportation means, where supplied fish mainly are singularized and oriented head/tail mainly in the longitudinal direction/direction of movement of the transportation means. Supplied fish is preferably sedated alive fish.

Moreover, the system includes sorting means for sorting the fish, which sorting means makes it possible to sort fish after the fish has been vaccinated, untreated fish or sorting out unwanted fish prior to vaccination.

In this way, a system has been provided for recognition, vaccination, sorting and documentation of fish.

By means of the means for acquiring information about fish each fish can be documented, e.g. by fork length, height, injuries, deviation, biomass (theoretical weight) and based on the same information also calculate, determine and/or perform one or more of the following actions:

- point coordinates for vaccination, e.g. injection point coordinates
- depth of vaccination, e.g. injection depth,
- sorting fish after vaccination, e.g. based on the size of the fish or similar,
- sorting out unwanted fish, e.g. because of injuries or deviation, or based on length, height, wrongly oriented fish or similar,
- calculating biomass (theoretical weight).

In addition to the points and actions mentioned above the system is arranged to be coordinated against the origin of the fish. With this is meant from which fish container, batch, etc. the fish was supplied to the system according to the invention, and thus can complete documentation of the individual fish be achieved.

The system works in the way that fish, preferably sedated fish, is fed mainly individually to the specially designed transportation conveyed from a suitable unit for this, e.g. a singularizing unit. In this way fish is supplied to the transportation means mainly in the longitudinal direction/direction of movement of the transportation means and preferably oriented with head or tail in the direction of movement of the transportation means. Preferably, the fish which is supplied to the transportation means are also provided at a distance (> 0 mm) between each fish.

Then the fish is transported by the transportation means past means for acquiring information about fish that detects/recognizes parameters of the individual fish, and checks whether several fishes are located too close or in continuation.

While fish is being transported mainly one by one of the transportation means, said transportation means preferably being in a continuous motion at a constant speed, past means for

acquiring information about fish, such as a unit for illumination and camera recognition, one or more cameras take pictures of fish which is being transported.

Then, each image is analyzed and sent to the control unit, which is arranged to control the system. Moreover, the system is provided with means and/or software for analyzing information from means for acquiring information about fish. By means of this information, each fish is analyzed on basis of fork length and height of the fish, alternatively also thickness of the fish. Moreover, the system can be arranged to detect or evaluate any injuries, such as gill cover, humpback, pinching injuries etc.

Based on the evaluation/analysis the control unit controls/instructs means for vaccination of fish with desired instructions. For example are means for vaccinating fish an injection and dosage unit, which is provided with optimal injection point and optimal injection depth for vaccination of the individual fish, including suitable dosage quantity.

Based on the same evaluation the control unit also controls/instructs sorting means on basis with sorting instructions after treatment and sorting out prior to treatment due to injuries or similar on the fish or non-detectable fish, e.g. double conveyed or wrongly oriented fish.

Information/data which is generated preferably also provides information about biomass (theoretical weight) of the fish batch being treated, preferably also including injures etc. in percentages.

The theoretical weight, i.e. the biomass, is a calculation based on fork length and height of the fish, but thickness of the fish can also be a relevant parameter.

After having passed means for acquiring information about fish, the transportation means supply the fish to means for ensuring that each fish is being vaccinated separately. Means for ensuring that fish is being vaccinated separately can for example be treatment channels, one or more specially designed carrying devices or similar. The means for ensuring that fish is vaccinated separately is preferably provided with means for turning the fish in desired back/abdomen direction and which in addition to turning the fish in desired direction is guiding it in place to ensure that fish is being vaccinated separately. Alternatively, the means for turning the fish in desired back/abdomen direction can be arranged ahead of the conveyor belt, so that the fish already has been turned correctly when it arrives on the conveyor belt. Moreover, sensor means are preferably arranged in the means to turning the fish in back/abdomen direction or means to ensure that fish is vaccinated separately which provides a signal to means for vaccinating fish and/or carrying devices that fish number X is on its way. In this way, the means for ensuring that fish is being vaccinated separately operates as a counter in addition to transporting the fish to vaccination position for engagement by means for vaccinating fish.

When the fish is located in means for ensuring that fish is vaccinated separately that ensures, means for vaccinating fish is activated. Data/information/instructions regarding coordinates for vaccinating etc. have already been provided to means for vaccinating fish on basis of prior performed detection/recognition and calculations. If desirable, a control can also be performed by means of an image recognition unit or similar arranged in connection with means for vaccinating fish or means for ensuring that fish is vaccinated separately. A picture is then taken prior to vaccination to check the position or condition of the fish. By fish position is meant that the nose of the fish is checked with regard to position (longitudinal direction). By condition is meant that the fish is checked with regard to if the fish lies with abdomen upwards, nose ahead etc.

At the same time as the fish arrive at the vaccination position, means for vaccinating fish is arranged in correct position based on data/information/instructions.

When the fish is in correct position in the means for ensuring that fish is vaccinated separately, desired vaccination of the fish is performed.

After vaccination of the fish, the means for ensuring that fish is vaccinated separately is prepared again and next fish is ready for vaccination. The fish leaves said means for ensuring that fish is being vaccinated separately and out in sorting means for sorting fish. The sorting means preferably includes one or more sorting channels, where for example one sorting channel is for fish of one given size, another sorting channel is for fish of another given size etc., and for example one sorting channel for non-vaccinated fish, i.e. for example fish that has been sorted out because of injuries or similar. It should be noted that unwanted fish due to injuries or similar preferably are sorted out before they arrive at means for vaccinating fish. The sorting means are adapted to means for ensuring that fish is vaccinated separately so that fish exiting means for ensuring that fish is vaccinated separately is collected by the sorting means. Moreover, the sorting means preferably includes means to guide the fish to correct sorting channel.

Accordingly, a method according to the invention includes transportation of fish by means of transportation means adapted for image recognition, past means for acquiring information about fish for detection/recognition of one or more of the following parameters of the individual fish:

I. fish length (fork length),

II. fish height,

III. fish thickness,

and on basis on this information:

- instruct means for sorting fish to sort out unwanted fish prior to vaccination, or
- instruct means for vaccinating fish, and instruct means for sorting fish after vaccination or sorting out untreated fish.

Moreover, the method preferably includes checking whether the fish has injuries, deviations, lies double, lies too close to each other and/or is wrongly oriented.

An example of settings for means for vaccinating fish are injection point coordinates, injection depth, dosage quantity, etc.

An example of settings for sorting out unwanted fish are for example due to injuries or deviations, or based on length, height, wrongly oriented fish or similar. Examples of sorting of fish after vaccination is with regard to length, height, biomass etc.

Moreover, the method preferably includes that fish being supplied to means for transportation of fish is supplied mainly singularized and with head/tail fin oriented in the longitudinal direction/direction of movement of means for transporting fish.

Moreover, the method includes registration of the sequence of fish being transported on means for transporting fish.

Moreover, the method includes moving fish from means for transporting fish to a vaccination position for performing vaccination of the individual fish.

Moreover, the method may include, in connection with movement of fish, turning the fish in desired back/abdomen direction.

Preferably, the method also includes checking the position of the individual fish and condition prior to vaccination of the fish, including the position (longitudinal direction) of the fish, and whether abdomen or back is directed upwards, nose ahead etc.

Moreover, the method may include documentation of all information related to the individual fish.

Further details and advantageous features of the invention will appear from the following example description.

Example

In the following, the invention will be described in detail with reference to the attached drawings, where

Figure 1 is a principal drawing of a system according to the invention,

Figure 2 is a principal drawing of a unit for singularizing fish,

Figure 3 illustrates how fish is analyzed,

Figure 4a is a principal drawing of means for ensuring that fish is vaccinated separately according to a first embodiment of the invention,

Figure 4b is a principal drawing of means for ensuring that fish is vaccinated separately according to a second embodiment of the invention,

Figure 5 illustrates sorting means according to the invention, and

Figure 6 is a principal drawing of means for vaccinating fish according to the invention.

Reference is now made to Figure 1 which illustrates a principal drawing of a system according to the invention, arranged for vaccinating fish. A system according to the invention includes a control unit 11, means for acquiring information about fish in the form of an illumination and camera recognition unit 12, which includes one or more cameras 13. Moreover, the system includes transportation means in the form of a conveyor belt 14, specially designed with regard to image recognition, for transportation of fish past the illumination and camera recognition unit 12.

For the vaccination of fish, the system includes an injection and dosage unit 15, and the system includes means for ensuring that fish is vaccinated separately in the form of treatment channels 20 or one or more carrying device 30 to move fish from the conveyor belt 14 to the vaccination position, which is described in further detail below.

For sorting, the system is provided with a sorting unit 40, which is described in detail below.

In this way it is provided a system for detection/recognition, treatment (vaccination), sorting and documentation of fish.

By means of the illumination and camera recognition unit 12 each fish can be detected/recognized and documented, e.g. by fork length, height, injuries, biomass (theoretical weight) and based on this information calculate and determine or execute one or more of the following actions:

- injection point coordinates for vaccination,
- injection depth of vaccination,
- sorting fish after vaccination, e.g. on basis of size or similar,
- sorting out unwanted fish, e.g. due to injuries or deviation, or based on length, height, wrongly oriented fish or similar, prior to vaccination,
- calculating biomass (theoretical weight).

Based on information from the illumination and camera recognition unit 12, the control unit 11 is arranged to control the injection and dosage unit 15, means 20, 30 for ensuring that fish is treated separately and the sorting unit 40.

In addition to the points and actions mentioned above, the system is arranged to be coordinated against the origin of the fish. With this is meant from which fish container, batch etc. the fish was introduced into the system for vaccination and sorting/sorting out.

The system works in the way that fish is supplied mainly one by one to the specially designed conveyor belt 14 from a suitable singularizing unit 50, such as e.g. shown in Figure 2. The illustrated singularizing unit 50 includes a roll pair 51 which rotates from each other and where fish to be singularized are supplied at an end 52 of the pair, whereby the roll pair 51 is slightly

inclined and/or is provided with at least one water nozzle located at the end 52 of the roll pair 51 where fish is supplied. Moreover, the singularizing unit 50 is preferably provided with automatic orientation of the fish with regard to head/tail fin, said unit including a roll 53 which rotates with a flow of fish guided to the roll 53 from the roll pair 51, and a receiver system 54 located downstream of the roll 51 which guides the fish out on the conveyor belt 14. This singularizing unit 50 is described in Norwegian patent application 20093302.

By means of the singularizing unit 50, fish which is mainly singularized and oriented with the head or tail in the direction of movement is supplied to the conveyor belt 14, preferably at a distance (> 0 mm) between each fish for the illumination and camera recognition unit 12 to be able to detect individual fishes. If two fishes lie too close, both fishes are to be sorted out, i.e. not vaccinated. The fish can lie in continuation and still be detected one by one. It should be mentioned that the singularizing unit 50 in Figure 2 represents only one out of many solutions that serves this purpose.

As fish is transported mainly one by one on the conveyor belt 14, preferably at a constant speed, past the illumination and camera recognition unit 12, one or more cameras 13 photographs fish laying on the conveyor belt 14. The cameras 13, e.g. of the type line cameras, take pictures continuously and coordinates with regard to the speed of the conveyor belt 14. Each image is analyzed and forwarded to the control unit 11, which is arranged to control the system, i.e. the conveyor belt 14, the cameras 13, means 20, 30 for ensuring that fish is vaccinated separately, means for vaccinating fish, and the sorting unit 40.

The control unit 11 is provided with means and/or software for analyzing information from the illumination and camera recognition unit 12, i.e. the camera(s) 13. By means of this, each fish is analyzed based on fork length and height of the fish, as illustrated in Figure 3, alternatively also thickness of the fish.

Moreover, the system can be arranged to detect and evaluate any injuries, such as gill cover, humpback, pinching injuries etc. from information from the illumination and camera recognition unit 12.

Based on the evaluation/analysis the control unit 11 controls/instructs means for vaccinating fish, in this example the injection and dosage unit 15, with optimal injection point and optimal injection depth for vaccination of the individual fish.

On basis of the same evaluation, the control unit controls/instructs the sorting unit 40 with sorting class, sorting out prior to vaccination due to injuries or similar on the fish or undetectable fish, e.g. double-fed or wrongly oriented fish.

Preferably, the information/data generated also provides information about biomass (theoretical weight) for fish which is vaccinated, and preferably also percentage portion of injuries etc. of vaccinated/sorted fish.

The theoretical weight, i.e. the biomass, is a calculation based on fork length and height of the fish, but also the fish thickness can be a relevant parameter. The measurement parameters of the fish, i.e. length, height and thickness, provides together provide a proper picture of the fish biomass (weight).

After having passed the illumination and camera recognition unit 12, the fish is then conveyed into means 20, 30 for ensuring that fish is vaccinated separately by the conveyor belt 14.

Reference is now made to Figure 4a which illustrates details of means for ensuring that fish is vaccinated separately, in the form of treatment channels 20, which are arranged for receiving and moving fish from the conveyor belt 14 to the vaccination position and further to sorting after vaccination has been performed. Prior to the conveyor belt 14, i.e. after the singularizing unit 50, there are preferably arranged means for turning the fish in the desired back/abdomen direction, such as an abdomen turner 21, which in addition to turn the fish in desired back/abdomen direction guides the fish in place at the conveyor belt 14. The abdomen turner 21 can also be arranged in the treatment channel 20 itself. The treatment channels 20 are arranged in after each other at a defined distance along the conveyor belt 14 and extend in a direction transversal down from the plane of the conveyor belt 14. The treatment channels 20 are arranged a distance down the conveyor belt 14, viewed in the longitudinal direction of the conveyor belt 14, so that the fish can be detected as described above before fish is guided out to the treatment channels 20. In connection with each treatment channel 20 there are along the conveyor belt 14 arranged means 22 to guide fish down into each of the treatment channels 20, e.g. in the form of one or more flipper systems. The fish is fed continuously into the treatment channels 20 in a fixed sequence. In the example, four treatment channels 20 are shown, but it is obvious that the number of treatment channels may vary and be adapted to the individual application. With starting point in four treatment channels 20, fish number one will be conveyed into the first treatment channel, fish number to into the second treatment channel, fish number three into the third treatment channel and fish number four into the fourth treatment channel by means of the means 22. Then fish number five will be guided down into the first treatment channel, fish number six into the second treatment channel etc. The treatment channels 20 are preferably provided with sensor means which registers that a fish is in place in the treatment channel 20 and generates a signal to the means for vaccinating fish, such as the injection and dosage unit 15, that fish number X is on its way/in place. Means for vaccinating fish, i.e. the injection and dosage unit 15, are arranged to each of the treatment channels 20 for vaccinating fish therein. Data/information from the control

unit 11 regarding injection point and injection depth has already been instructed to the injection and dosage unit 15 based on the prior conducted detection/recognition and calculations. Advantageously, checking the fish position (zero point nose + correctly oriented) can be performed prior to vaccination. The control is for example conducted by means of an image recognizing unit, sensor means or similar (not shown), e.g. arranged in connection with the injection and dosage unit 15. At the same time as the fish arrives in the treatment channel 20, the injection and dosage unit 15 is aligned in correct position based on data/information about length from the control unit 11 and fish number X. By correct position is meant correctly adapted distance from a zero point, which for example will be the fish nose/a front plate 23 arranged in the end of the treatment channel 20. Moreover, the treatment channel preferably includes a pivotal plate 24 on which the fish lies and nose of the fish is resting against the front plate 23 at the end of the treatment channel 20. The pivotal plate 24 may advantageously be articulated for later output of vaccinated fish. When the fish is in place in the treatment channel 20 the injection and dosage unit 15, as mentioned above, is activated and an injection needle (not shown) is injected into the fish to correct depth. By correct depth is meant that the needle shall be located in the abdominal cavity of the fish. When the needle is in place the injection and dosage unit 15 provides a signal and dosage is activated and the vaccine is supplied into the abdominal cavity of the fish, which means between the abdominal wall and the stomach/intestines. When dosage is completed and the injection and dosage unit 15 has been retracted the pivotal plate 24 is activated. The pivotal plate rotates > 0 degrees and drops the fish down into means 40 for sorting fish. The needle is preferably controlled continuously so that there is a continuous control whether the fish has been vaccinated or not. Control of the needle is for example based on an inductive transmitter which produces an approval signal if the needle point is there, or negative signal if it fails to find the needle tip. Control of the vaccine in the injection and dosage unit 15 is for example based on a pressure difference at the time of injection. The pressure difference is measured by means of for example a pressure gauge. At low pressure a signal is produced that the vaccine is not present. The needle is affected by an air pressure after each injection incident which during normal operation shall contribute to the needle being free from shell and other impurities. In case of needle breakage or insertion problems of the needle tip, the injection and dosage unit 15 is to be stopped from further vaccination and any fish present in the system is guided out and sorted in the sorting unit 40 for re-vaccination, together with fish which for example has been double-fed and wrongly oriented, and other occasions where the fish cannot be vaccinated.

Undetectable fish, injured fish, fish that is wrongly oriented in relation to back/abdomen direction or similar are sorted out at the rear end of the conveyor belt 14 and transported back to the singularizing unit 50 if there is no injury on the fish. If the fish is injured it is sorted out.

Reference is now made to Figure 4b which illustrates a principal drawing of a second embodiment of means for ensuring that fish is vaccinated separately in the form of a carrying device 30. The carrying device 30 is preferably mainly cylinder shaped, which at its outer surface is provided with carrying elements 31 which extend in the longitudinal direction of the carrying device 30 for receiving and moving of fish from the conveyor belt 14 to the vaccination position and further to sorting after treatment is completed.

The carrying device 30 is preferably also provided with means for turning the fish in desired back/abdomen direction, such as an abdomen turner 21, which in addition to turn the fish in desired back/abdomen direction guides it in place in the carrying device 30. The abdomen turner 21 preferably includes a sensor 32 which produces a signal to the carrying device 30 and the injection and dosage unit 15 that fish number X is on its way. The abdomen turner 21 is arranged in the longitudinal direction of the conveyor belt 14, so that transported fish is conveyed into the abdomen turner 21 and then into the carrying device 30.

When a fish is in place in the carrying device 30, the carrying device 30 is moved one step forward and is ready to receive the next fish. Data/information from the control unit 11 regarding injection point and injection depth have already been instructed to the injection and dosage unit 15 based on the prior performed detection/recognition and calculations.

Checking the fish position (zero point + correctly oriented) may advantageously be performed before the carrying device 30 is stepped to the vaccination position. The control is performed for example by means of an image recognition unit (not shown) arranged in connection with the injection and dosage unit 15/cycle wheel 16.

At the same time as the fish is stepped forward to vaccination position, by rotating the carrying device 30, the injection and dosage unit 15 is arranged in correct position based on data/information about fork length from the control unit 11 and fish number X. By correct position is meant correctly adapted distance from a zero point, which e.g. will be fish nose of the fish/a front plate 33 of the carrying device 30. When the carrying device 30 has stopped the injection and dosage unit 15 is activated and vaccination is conducted in the same manner as described above.

Undetectable fish, injured fish, wrongly oriented fish in relation to back/abdomen direction or similar is either sorted out before the fish enters the carrying device 30 or out after the carrying device 30. Fish that is not injured is transported back to the singularizing unit 50 whereas fish with injuries are sorted out.

Reference is now made to Figure 5, which shows details of a sorting unit 40 according to the invention. The sorting unit 40 includes one or more sorting channels 41, e.g. one sorting channel 41 for vaccinated fish of a given size, another sorting channel 41 for vaccinated fish of another given size etc., and a sorting channel 41 for fish which has not been vaccinated, i.e. fish that is

sorted out due to injuries or similar. The sorting unit 40 is adapted to the treatment channels 20 or the carrying device 30 so that fish that leave the treatment channels 20 or the carrying device 30 are collected by the sorting unit 40. The sorting unit 40 includes a sorting arm/chute 42 which guides the fish to the correct sorting channel 41. In this way the fish will, after vaccination, be guided to the correct sorting channel 41 based on data/information from the illumination and camera recognition unit 12, e.g. sorting based on theoretical weight, length, injuries or similar.

Reference is now made to Figure 6 which shows details of an injection and dosage unit 15 for vaccination according to the invention. The injection and dosage unit 15 includes three units in the form of an injection unit 60, a suction unit 61 for production of an underpressure, and a dosage unit 62. The injection unit 60 is arranged for positioning of the suction unit 61 and the dosage unit 62 in the longitudinal direction. The suction unit 61 is preferably arranged to the dosage unit 62. Moreover, the injection and dosage unit 15 includes a dosage needle (not shown) for injection of an amount of vaccine given by the dosage unit 62, and means for cleaning the dosage needle. The injection unit 60 and the suction unit 61 are arranged for being positioned in longitudinal direction and for elevation, respectively. Width adjustment is performed by the carrying device 30 or treatment channels 20. Fish to be treated has prior been analyzed with regard to length, height and possibly thickness by the illumination and camera recognition unit 12. Before the fish arrives at the vaccination position the injection unit 60 has been positioned based on the length given by the illumination and camera recognizing unit 12. When an incoming fish is located in the vaccination position, the suction device 61 is activated and moves to the correct elevation from height given by the illumination and camera recognition unit 12. The suction device 61 activates an underpressure so that the fish is sucked into the injection unit 60, in connection with vaccination. The dosage unit 62 is activated and the dosage needle of the injection unit 61 penetrates the fish and vaccination is performed. When vaccination is completed the dosage needle is retracted to the injection unit 61 at the same time as the underpressure created by the cleaning and suction unit 61 is closed off and air/water is applied to the dosage needle to clean the injection unit 60. This can for example be performed by providing the injection unit 60 with a cleaning sleeve. The suction device 61 then retains its basic position. The injection unit 60 is takes the next position (fish number 2) and the sequence may start all over again.

Modifications

Means for acquiring information may include different types of cameras, color or black and white, possibly lasers, x-ray, ultrasound, NIR (Near Infrared Spectroscopy), etc. The system and method according to the invention can be adapted to detect/determine fat, protein and water content of the fish. The detection/evaluation may, as mentioned above, be conducted whereas

the fish is transported and in combination with another information collection. The content information can be performed by using NIR or similar.

The system and method of the invention can be adapted for marking individuals, either through physical marking or by ID chips, or by taking samples for DNA. The system can also be adapted to read ID chips for storing of data. These data can also be used in connection with sorting or stored in databases for further processing.

The system according to the invention may include several carrying devices for increased capacity. However, this requires that the system includes means for vaccination in connection with each carrying device. It is also conceivable to arrange means for distributing fish into different carrying devices at the end of the conveyor belt.

The system may of course also include several parallel lines which end in the same sorting unit.

Claims

1. Method for recognizing, vaccinating, sorting and documenting alive fish, by means of a system including a control unit (11), means (12) for acquiring of information about fish, transportation means (14) for transporting fish past means (12) for acquiring information about fish, and means (15) for vaccination of the individual fish, **characterized in** that the method includes transporting fish by means of transportation means (14) adapted for image recognition, past means (12) for acquiring information about fish for detecting/recognizing one or more of the following parameters for the individual fish:

i. length of the fish (fork length),

ii. height of the fish,

iii. thickness of the fish,

and on basis of this information:

- instruct means (40, 41, 42) means for sorting fish to sort out unwanted fish prior to vaccination, or

- instruct means (15) for vaccinating fish, including instructing means (40, 41, 42) for sorting fish after vaccination or sorting out untreated fish.

2. Method according to claim 1, **characterized in** that it includes supplying fish to the transportation means (14) which is mainly singularized and with head/tail fin oriented in the longitudinal direction/direction of movement of the transportation means (14).

3. Method according to claim 1, **characterized in** that it includes calculating biomass of the fish, i.e. theoretical weight.

4. Method according to claim 1, **characterized in** that it includes checking whether the fish has injures, deviations, laying double, lie too close to each other or is wrongly oriented.

5. Method according to claim 1, **characterized in** that it further includes marking individuals, either by physical marking or by ID chips, or by taking samples for DNA.

6. Method according to claim 1, **characterized in** that it includes detection/determination of content of fat, protein or water of the fish from image recognition, ultrasound, x-ray or NIR.

7. Method according to claim 1, **characterized in** that it includes registering the sequence of fish being transported on the transportation means (14).

8. Method according to claim 1, **characterized in** that it includes moving fish from the transportation means (14) to vaccination position for vaccinating the individual fish.

9. Method according to claim 8, **characterized in** that the method, in connection with moving fish to the vaccination position or in connection with supply of fish to the conveyor belt (14), includes turning the fish in desired back/abdomen direction.

10. Method according to claim 1, **characterized in** that it includes checking position and condition of the individual fish prior to vaccination of the fish is performed.

11. Method according to claim 1, **characterized in** that it includes calculation of injection point coordinates for vaccination and injection depth for vaccination, and calculation of vaccination doses.

12. Method according to claim 4, **characterized in** that it includes sorting out unwanted fish due to injuries or deviations, based on length, height or wrongly oriented fish.

13. Method according to claim 1, **characterized in** that it includes sorting fish after vaccination based on one or more of the following: length, height, thickness, biomass or ID marking.

14. Method according to any one of the claims 1-13, **characterized in** that it includes documenting all information regarding the individual fish.

15. System for recognizing, vaccinating, sorting and documenting alive fish, said system including a control unit (11), means (12) for acquiring information about fish, transportation means (14) for transport of fish past means (12) for acquiring information about fish, and one or more means (15) for vaccinating the individual fish, **characterized in** that the means (12) for acquiring information about fish is an illumination and camera recognition unit, which is arranged for performing image analysis of the fish be transported past by the transportation means (14) to find, investigate or calculate one or more of:

- length of the fish (fork length),
- height of the fish,

- fish thickness,
- biomass (theoretical weight),
- examine whether the fish has injures, deviations, lies double, lies too close to each other or is wrongly oriented.

16. System according to claim 15, **characterized in** that the system includes means (40, 41, 42) for sorting fish:

- after vaccination or untreated fish, based on one or more of: fork length of the fish, height, biomass,
- sorting out unwanted fish based on one or more of: injuries, deviations, wrongly oriented fish or undetectable fish before the fish is vaccinated.

17. System according to claim 15, **characterized in** that the system includes means (20, 30) for ensuring that fish is vaccinated separately.

18. System according to claim 17, **characterized in** that means for ensuring that fish is vaccinated separately is treatment channels (20), which treatment channels (20) are arranged to ensure that fish is being vaccinated separately, which treatment channels (20) being arranged in the longitudinal direction of the means (14) for transporting fish, which treatment channels (20) further are arranged to bring the fish to a vaccination position for engagement by means (15) for vaccinating fish.

19. System according to claim 18, **characterized in** that the system includes means (22) for guiding fish down into the treatment channels (20).

20. System according to claim 17, **characterized in** that the system includes one or more carrying devices (30) provided with carrying elements (31), which carrying devices (30) being arranged for ensuring that fish is vaccinated separately, which carrying devices (30) being arranged in the longitudinal direction of the means (14) for transporting fish, which carrier devices (16) being arranged to bring the fish to a vaccination position for engagement by means (15) for vaccinating fish.

21. System according to claim 17, **characterized in** that means (21) for turning the fish in desired back/abdomen direction is arranged in connection with supply of fish to means (14) for

transporting fish, in connection with treatment channels (20) or carrying devices (30) for the same, and guiding the fish in place in the treatment channel (20) or carrying device (30).

22. System according to claim 21, **characterized in** that sensor means (20) are arranged to count the number of fish supplied to the treatment channels (20) or the carrying devices (30).

23. System according to claim 13, **characterized in** that the system includes means (50) for supplying fish to the transportation means (14), which means (50) for supply of fish being arranged to supply fish which is mainly singularized with a given distance and with a head/tail fin orientation of the fish mainly in the longitudinal direction/direction of movement of the transportation means (14).

24. System according to any one of the claims 15-23, **characterized in** that the transportation means (14) are a specially designed conveyor belts with regard to illumination and camera recognition, and arranged to feed the fish into treatment channels (20) or carrying devices (30).

25. System according to any one of the claims 15-24, **characterized in** that the system includes an image recognizing unit arranged in connection with treatment channels (20), carrying devices (30) or means (15) for vaccinating fish for checking position and condition of the fish prior to vaccination.

26. System according to claim 15, **characterized in** that the means (15) for vaccinating fish is an injection and dosage unit for injection of a composition into each individual fish.

27. System according to claim 26, **characterized in** that the injection and dosage unit (15) includes an injection unit (60), a suction unit (61), and a dosage unit (62).

28. System according to claim 27, **characterized in** that the injection unit (60) includes a dosage needle, and means for cleaning the dosage needle.

29. System according to claim 27, **characterized in** that the suction device (61) is arranged to provide an underpressure to suck fish from treatment channels (20) or carrying devices (30) to vaccination position adjacent to the injection unit (60).

30. System according to claim 15, **characterized in** that the system includes one or more of the following means:

- means for marking an individual, either by physical marking or by ID chips, or by taking samples for DNA,
- means for reading ID chips for storing of data,
- means for detecting/determining content of fat, protein and water in the fish.

31. System according to claim 15, **characterized in** that the control unit (11) is provided with means and/or software to execute the method of claims 1-14.

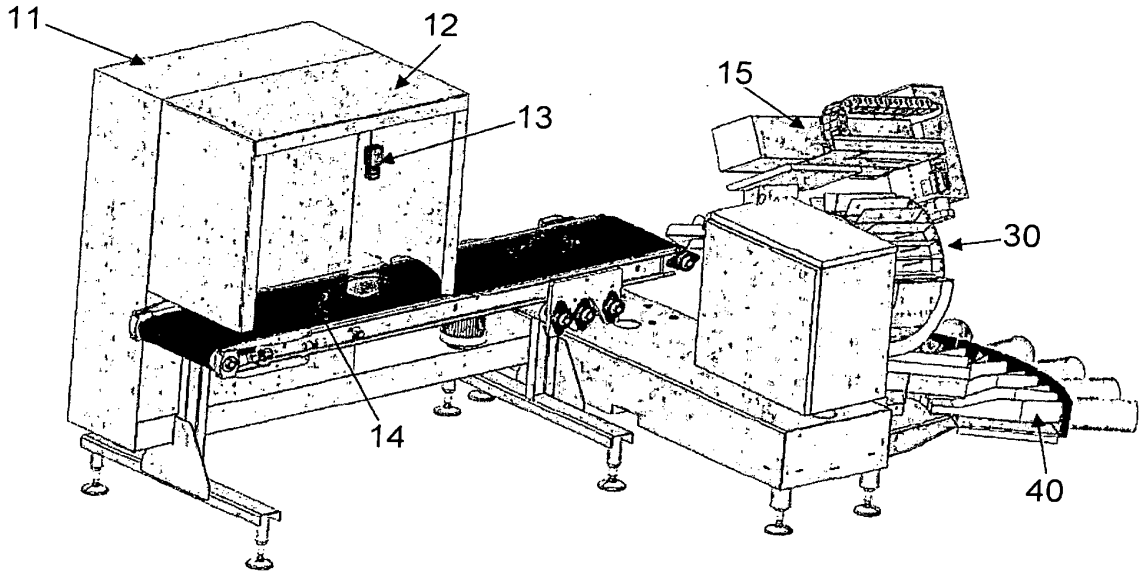


Figure 1.

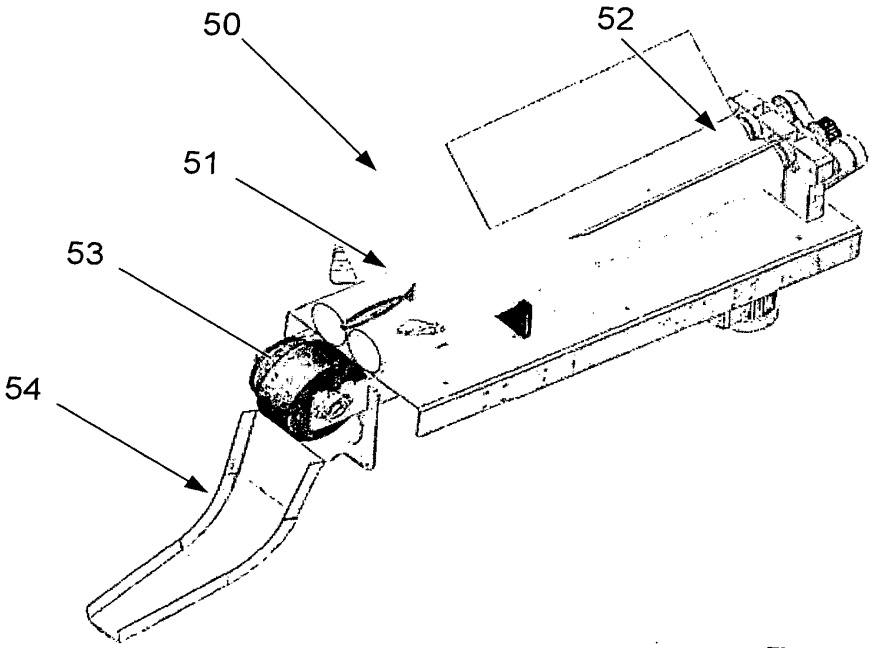


Figure 2.

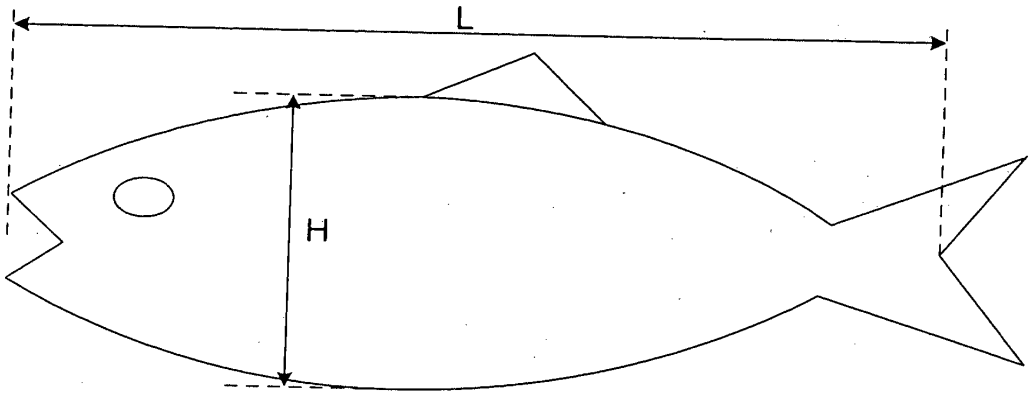


Figure 3.

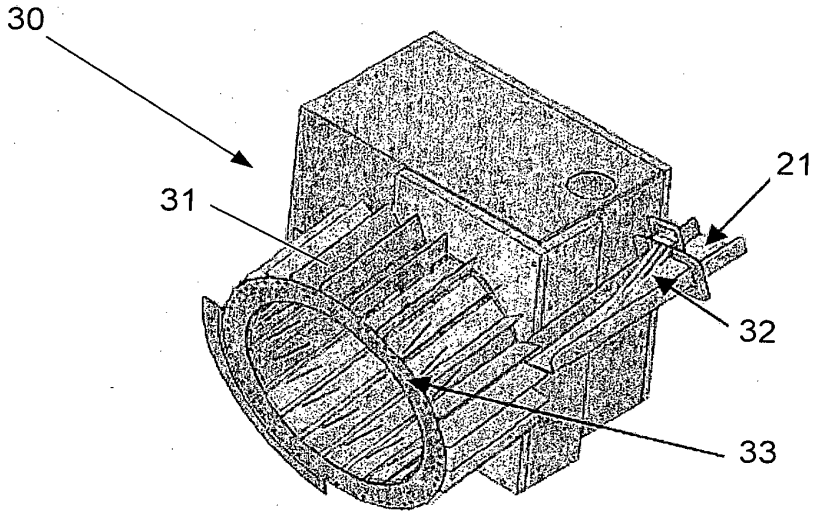


Figure 4b.

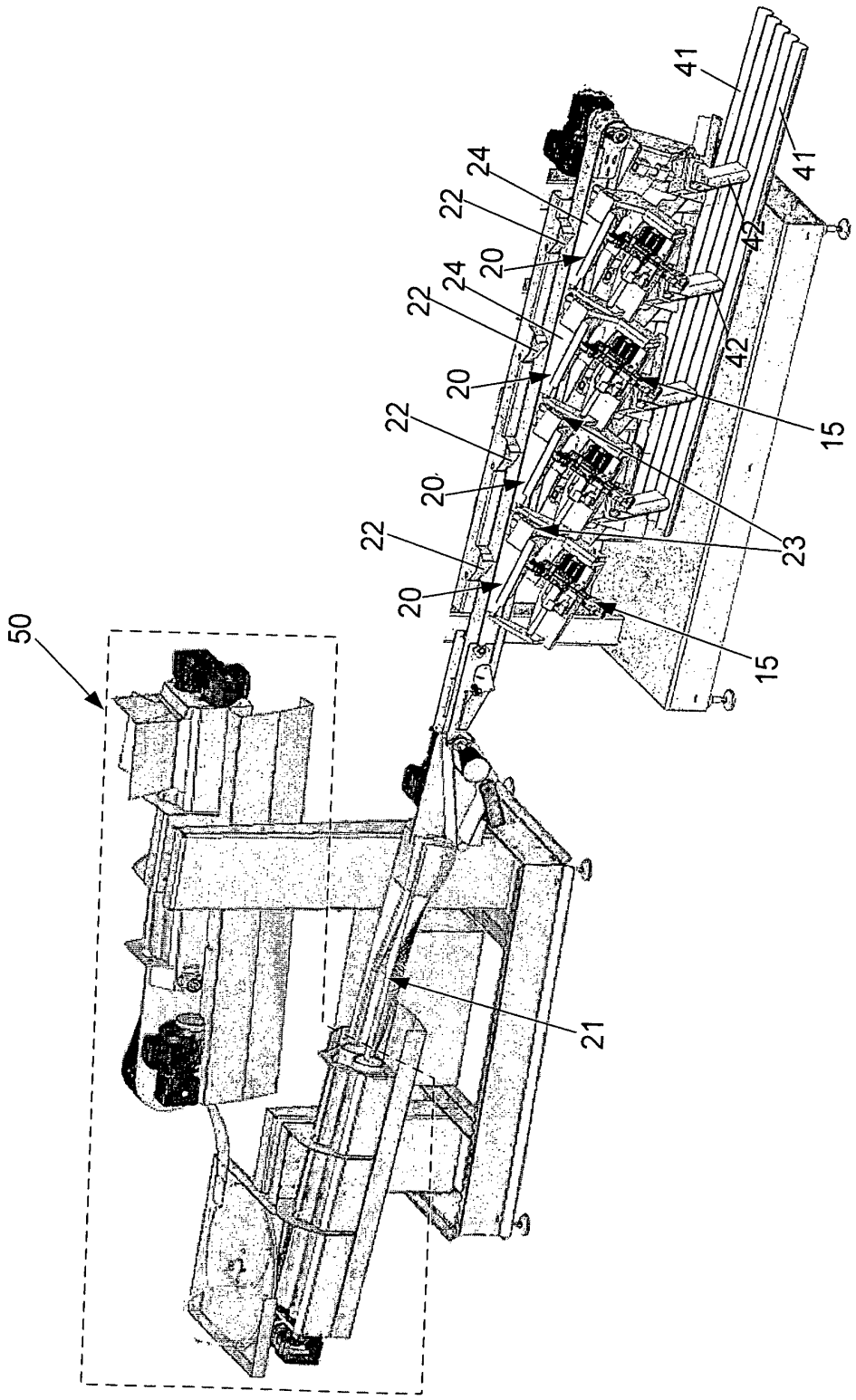


Figure 4a.

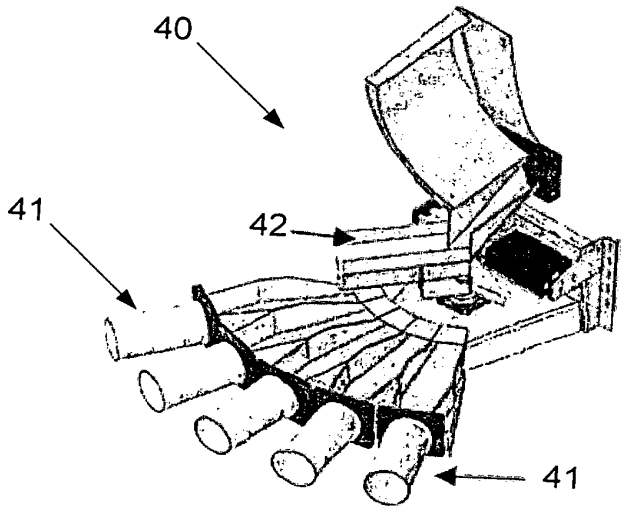


Figure 5.

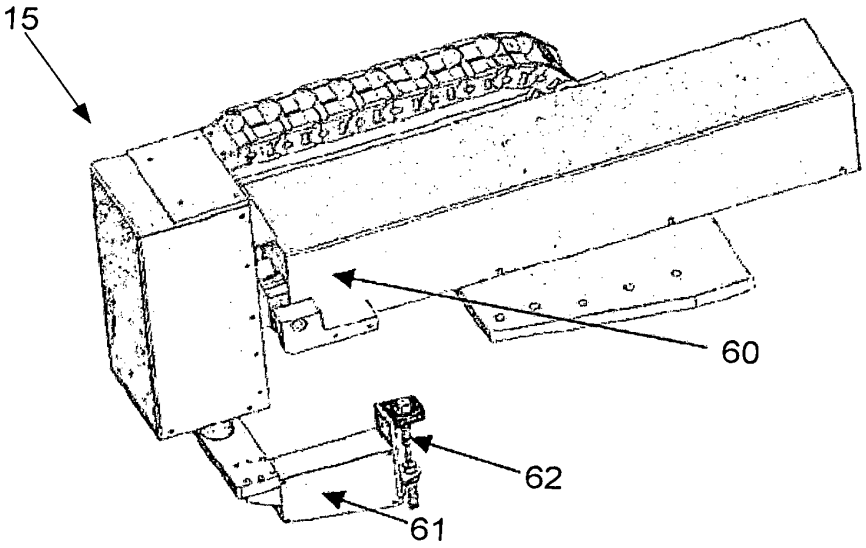


Figure 6.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO2011/000183

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: A01K, A22C, A61D

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

SE, DK, FI, NO classes as above

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

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	JP 2010179075 A (NIPPON ELECTRO SENSARI DEVICE KK), 19 August 2010 (2010-08-19); (abstract) Retrieved from: PAJ database; Original document: figures 1,4	1-26, 30, 31
P, Y	--	27-29
Y	NO 320008 B1 (NORDIC FISH TECH AB), 18 November 2004 (2004-11-18); whole document	1-31
	--	
Y	US 4934537 A (DEBOURKE PATRICK J), 19 June 1990 (1990-06-19); abstract; column 2, line 66 - column 3, line 7; column 3, line 23 - line 57; column 5, line 26 - line 61; figures 1,2; claim 1	1-26, 30, 31
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
09-09-2011	22-09-2011
Name and mailing address of the ISA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86	Authorized officer Erik Dahlblom Telephone No. + 46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO2011/000183

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2009021232 A2 (MASSACHUSETTS INST TECHNOLOGY ET AL), 12 February 2009 (2009-02-12); abstract; pages 3, 13-14; figure 1A --	27-29
Y	WO 9409920 A1 (MINI AGRICULTURE & FISHERIES ET AL), 11 May 1994 (1994-05-11); abstract; page 6; figure 7 --	1-26, 30, 31
A	US 5215035 A (ROD TORBEN ET AL), 1 June 1993 (1993-06-01); abstract; column 3, line 58 - column 4, line 27 --	1-31
A	US 20030028908 A1 (TAKESHITA TOMOKO ET AL), 6 February 2003 (2003-02-06); abstract; paragraph [0057]; figure 1 --	1-31
A	US 20060081192 A1 (MASSEY AULDIN J ET AL), 20 April 2006 (2006-04-20); abstract; paragraphs [0020]-[0022]; figures --	1-31
A	JP 2003159265 A (TOWA DENKI SEISAKUSHO CO LTD), 3 June 2003 (2003-06-03); (abstract) Retrieved from: PAJ database; Original document: figures 6,7 --	1-31
A	JP 2001112795 A (EISAI CO LTD ET AL), 24 April 2001 (2001-04-24); (abstract) Retrieved from: PAJ database; Original document: whole document --	1-31
A	NO 162941 B (TRIO IND AS), 29 May 1989 (1989-05-29); whole document -- --------	1-31

Continuation of: second sheet
International Patent Classification (IPC)
A01K 61/00 (2006.01)
A61D 7/00 (2006.01)

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Paper copies can be ordered at a cost of 50 SEK per copy from PRV InterPat (telephone number 08-782 28 85).

Cited literature, if any, will be enclosed in paper form.

JP	2010179075	A	19/08/2010	NONE			
NO	320008	B1	18/11/2004	NONE			
US	4934537	A	19/06/1990	NONE			
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JP	2003159265	A	03/06/2003	CN	1236825	C	18/01/2006
				CN	1406639	A	02/04/2003
				JP	3936264	B2	27/06/2007
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				KR	100695552	B1	15/03/2007
				TW	550100	B	01/09/2003
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(54) **Title**: ENRICHMENT APPARATUS AND ENRICHMENT APPLICATIONS

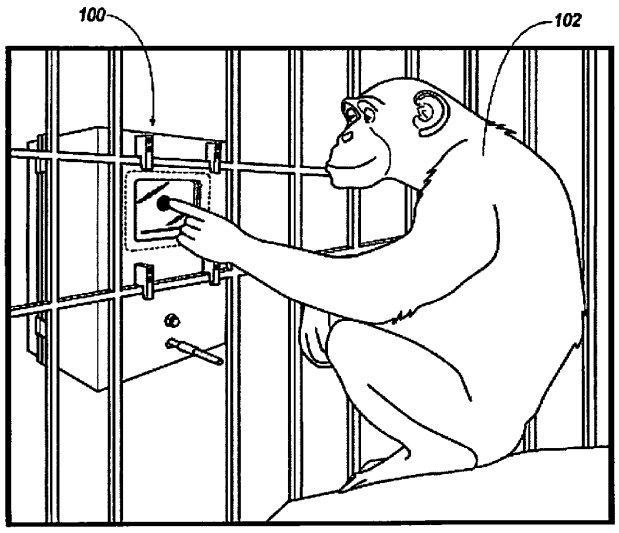


FIG. 1

(57) **Abstract**: The present invention features a method and apparatus for enriching the environment of an animal. The apparatus presents a stimulus to an animal, and the animal may input the correct response to the stimulus into an interface. Upon a correct response the apparatus delivers a treat, indication, or combination thereof to the animal. The apparatus may increase the complexity of the stimulus with each correct response. The apparatus may also be connected to social media to track and compare the results of the animal's actions with other animals.

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ENRICHMENT APPARATUS AND ENRICHMENT APPLICATIONS

TECHNICAL FIELD

[0001] This disclosure relates to an enrichment apparatus and enrichment applications. In particular, the enrichment apparatus provides control of software stimulus and of a peripheral device to deliver treats to animals.

PRIORITY CLAIM

[0002] This application claims priority under 35 U.S.C. § 119(e) to U.S. Provisional Patent Application Number 61/930, 619 filed on January 23, 2014, the entire contents of which are hereby incorporated by reference.

BACKGROUND

[0003] The USDA requires that regulated non-human animals (esp. primates) be provided with environmental enrichment (i.e., interactive devices other than the basic caging provided). Environmental enrichment allows the subjects to participate in a range of behaviors including but not limited to foraging, climbing, and cognitively-engaging tasks. In addition to laws instituted by the USDA, a range of companion and zoo animals benefit from a range of behaviors including cognitive engagement.

[0004] Current methods to provide enrichment, particularly for primates, rely upon simple food-foraging, non-mechanical devices, such as Kong® toys filled with treats, and small shelves of indoor-outdoor 'grass' with little bits of food laced throughout. Primate Products, Inc. produces a device, the Puzzle Feeder™, which provides challenging puzzle solving tasks to obtain food held within the device. The setup of the task, cleaning, and recording activity of use are highly time consuming for the human operators. Such a system does not allow for ease of use or the tracking of behavioral health of the animals. Currently in the laboratory environment, computer stimulating or testing programs for caged animals require multiple technicians to set-up the computer systems and corresponding peripheral devices. These systems are not small, self-contained units that are easily portable by a single individual or operator. These laboratory systems require the animals to be secured into a user position or chair to maintain an interaction for extended period of time. As a result, these systems do not provide the necessary enrichment.

[0005] Similar enrichment needs and low tech solutions exist for domestic pets. There are a multitude of companion animal toys meant to enrich the lives of pets. However, they are

often easily destroyed by the pet, and are prone to loss of use due to boredom. Thus, there is a need for a device that directly provides, with ease of a single human operator, behavioral enrichment to a range of non-human animals. Additionally, there is a need for a small, portable, self-contained device that can be used repeatedly by each animal and serially by multiple animals and that can track behavioral health or provide enrichment over an extended period of time. Many companion animals may also benefit from varied and complex behavioral tasks maintained by food reinforcement thereby increasing the behavioral health of the animals.

DESCRIPTION OF DRAWINGS

[0006] FIG. 1 is a drawing illustrating an example environment of an example enrichment apparatus.

[0007] FIG. 2 is a drawing illustrating an example exterior of an enrichment apparatus.

[0008] FIG. 3 is a schematic illustrating an example interior of an enrichment apparatus.

[0009] FIG. 4 is a schematic illustrating an example interior of an enrichment apparatus.

[0010] FIG. 5 is a flow chart illustrating an example set of operations that can be executed by an enrichment application.

[0011] FIG. 6 is a drawing illustrating an example enrichment apparatus for a pet, domestic animal, or farm animal.

[0012] Like reference symbols in the various drawings indicate like elements.

DETAILED DESCRIPTION

[0013] FIGS. 1 and 2 illustrate an example of an enrichment apparatus 100. The enrichment apparatus 100 is a small, self-contained, and portable device which can be set-up for operation by a single individual. The enrichment apparatus 100 is configured to provide environmental enrichment to an animal 102. While depicted as a monkey in FIG. 1, an animal 102 may be any type of non-human animal, including but not limited to, a monkey, a gorilla, a dog, a cat, a dolphin, a whale, a seal, a bird, or any other suitable species. In an example environment, the enrichment apparatus 100 presents the animal 102 with a stimulus, such as a puzzle or game. The enrichment apparatus 100 includes a computing device, such as a tablet, that presents the stimulus to the animal 102. An operator (e.g., a keeper of the animal 102) can provide one or more parameters to the computing device such that one or more aspects of the stimuli can be altered.

[0014] When the animal 102 properly responds to the stimulus, the enrichment apparatus 100 outputs a treat to the animal 102. A treat can be any type of reward including, but not limited

to, juice, fruit, processed food, solid or liquid food, and meat. In this way, the enrichment apparatus 100 may provide a cognitively challenging task that is designed to improve the behavioral health of the animal 102. The enrichment apparatus 100 may also positively reinforce the animal 102 as the animal 102 displays its cognitive skills. In some implementations, the enrichment apparatus 100 allows the animal 102 to interface with the enrichment apparatus 100 without being restrained into a user position such as a chair or within a cage. This allows for greater enrichment and behavioral engagement by the animal 102 over longer periods of time both daily and over long-term.

[0015] In some implementations, the enrichment apparatus 100 includes an interface 110, a housing 112, a treat delivery mechanism 114, an indicator 116, and one or more fasteners 118. In some implementations, the enrichment apparatus 100 with the interface 110, a treat delivery mechanism 114, and an indicator 116, is self-contained within a small housing 112 unit.

[0016] In the illustrated example, the interface 110 is a touch screen of a tablet (discussed further below). The interface 110 can present the stimulus (which can be visual, audible, olfactory or a combination thereof) to the animal. The interface 110 can further receive input from the animal 102. While shown as a touch screen, the interface 110 can additionally or alternatively include other input means, such as a keyboard, buttons, levers, a touchpad, or a combination thereof.

[0017] The housing 112 can be any suitable structure to house the internal components of the enrichment apparatus 100 (discussed with respect to FIGS. 3 and 4). The housing 112 can have a first aperture 113 that allows the animal 102 to access the interface 110. The housing 112 may also define a second aperture 115 through which the treat delivery mechanism 114 protrudes. In some implementations, the housing 112 can be opened, such that the interior of the apparatus 100 is accessible to a human operator. In some implementations, the housing 112 is made of light weight material for easy transport by a single operator. In additional implementations, the housing 112 is made of material that is strong enough to withstand adverse conditions, damage, rough, or careless handling by the operator or the animal 102. In other implementations, the self-contained housing 112 only provides the animal 102 access or engagement with the interface 110 and treat delivery mechanism 114.

[0018] The treat delivery mechanism 114 outputs treats to the animal 102. In the illustrated example, the treat delivery mechanism 114 is a spout that extends through the second aperture 115. When the animal 102 correctly responds to the stimulus, juice (or another liquid treat) is disposed through the spout. In implementations having solid treats, the treat

delivery mechanism 114 can include a chute that deposits the treats. The enrichment apparatus 100 may alternatively include any other suitable treat delivery mechanism 114.

[0019] The fasteners 118 can be any suitable mechanisms for fastening the enrichment apparatus 100 to a structure. In the illustrated example, the fasteners 118 are hooks, whereby the hooks are rested upon bars of an enclosure (e.g., cage). The exact type of fastener depends on the type of enclosure or environment of the animal 102.

[0020] The indicator 116 can be any mechanism that provides a indication to the animal 102. For example, the indicator 116 can be a light, speaker or scent-emitting device. The indicator 116 can provide an indication when, for example, the animal 102 has successfully interacted with the enrichment apparatus 100 or when the animal 102 can use or engage the apparatus 100 again.

[0021] The exterior of the enrichment apparatus 100 may include additional components not shown or discussed. The enrichment apparatus 100 depicted in FIGS. 1 and 2 is configured for a zoo or laboratory environment. The fasteners 118 allow the enrichment apparatus 100 to be hung outside an enclosure (e.g., a cage) of the animal 102, such that the animal 102 can access the interface 110 using its snout, fingers, beak, nose, and/or toes.

[0022] In some implementations, the enrichment apparatus 100 is configured for household pets, such as dogs, cats or birds. In this way, the enrichment apparatus 100 can provide a platform for pet and owner interactions (either in person or remotely).

[0023] FIG. 3 and FIG. 4 illustrate an example interior of the enrichment apparatus 100. The enrichment apparatus 100 can include a computing device 210, a treat release system 220, a power supply 240, and a battery 250.

[0024] In implementations, the treat release system 220 includes a reservoir 222, a valve 224, a valve actuator 226, one or more sensors 228, a tube 230, a vent 232, and a filter 234. The reservoir 222 can be a receptacle that contains the treats. The reservoir 222 can include a removable cap 223. A tube 230 extends through the cap 223 and couples to the valve 224. The valve 224 couples to the treat delivery mechanism 114 (FIG. 1). The valve 224 is opened and shut by the valve actuator 226. In this way, the valve actuator 226 opens the valve 224 and treats are output through the tube 230, valve 224, and treat delivery mechanism 114 as a result of the gravitational forces acting upon the treats. In implementations where the treats are liquid, the valve 224, tube 230, or treat delivery mechanism 114 may have a vent 232 and filter 234 coupled thereto, such that an opposing airflow can aid the dispensing of the liquid treats 202. The filter 234 prevents impurities from entering the treat delivery mechanism by way of the vent 232.

[0025] The valve actuator 226 is powered by the power supply 240 (which draws power from the battery 250) and receives input from one or more sensors 228 and/or the computing device 210 directly. The sensors 228 can be light sensors and/or sound sensors. In some implementations, the computing device 210 is configured to output either a light indicator 218 or sound indicator when the animal 102 successfully responds to the stimulus. In response to a light indicator 218 or sound indicator, the sensors 228 output a signal to the valve actuator 226. The valve actuator 226 opens the valve 224 in response to the signal. In other implementations, the computing device 210 electronically couples to the valve actuator 226. In these implementations, the computing device 210 outputs a signal. The signal causes the valve actuator 226 to open the valve 224.

[0026] In the illustrated example, the computing device 210 is a tablet computer, such as a NOOK®, IPAD®, or a GALAXY NOTE®. The computing device 210 may be any other suitable computing device (e.g., laptop computer, smartphone, or micro controller). The computing device 210 may be affixed to the interior portion of the housing 212 by way of a mount 214. The mount 214 can be a form-fitted plastic mold that is sized according to the perimeter of the computing device 210. The mount 214 may have supports (not shown), such as straps or flanges that hold the computing device 210 in place. The computing device 210 can be slideably inserted onto/into the mount 214 such that the computing device 210 is held firmly in place and able to withstand the force of an animal 102 pressing thereon. In this way, an animal 102 that applies a force to the interface 110 (e.g. pushes on the touchscreen) cannot unseat the computing device 210 from the mount 214.

[0027] The computing device 210 includes one or more processors that execute machine-readable instructions corresponding to an enrichment application. In the illustrated example, the enrichment application presents the stimulus by displaying a shape 216 on the interface 110. When the animal 102 correctly responds to the stimulus, the enrichment application causes a treat or treats to be dispensed from the treat reservoir 222. In some implementations, the enrichment application displays light indicators 218 when the animal 102 correctly responds to the stimulus (e.g., presses on the shape 216). The location on the interface 110 where the light indicators 218 are displayed corresponds to the location of the sensors 228, such that light indicators 218 trigger the sensors 228. Additionally or alternatively, the enrichment application can command the computing device 210 to output a sound indicator (e.g. a sound at a particular frequency) to trigger a sound sensor 228. Alternatively, the computing device 210 may be electronically coupled to the valve actuator 226, such that when the animal 102 responds to the stimulus, the computing device 210 directly outputs the signal to the valve actuator 226.

[0028] The computing device 210 may be loaded with several enrichment applications that offer different stimuli and/or tasks to the animal 102. For example, a more complex enrichment application may be configured to display sample patterns that the animal 102 is to repeat. When the animal successfully repeats the pattern, the enrichment application can initiate delivery of a treat to the animal 102 (e.g., emitting a light indicator 218 or a signal to the valve actuator 226). In some implementations, the enrichment application can include multiple stimuli (i.e., games or puzzles) that can increase in difficulty or complexity as the animal 102 solves the less complex stimuli.

[0029] In some implementations, the enrichment applications are user-configurable. For example, a user (e.g., a keeper of the animal 102) can provide parameters relating a duration of an enrichment session, a duration of a stimulus (i.e., how much time an animal is allotted to respond to a particular stimulus), a treat dispensing duration (i.e., how long to display a light indicator 218 or to provide a signal to the valve actuator 226), how often the animal 102 can repeat the enrichment exercise, and/or the difficulty of the enrichment application.

[0030] In some implementations, the enrichment application can collect empirical data that tracks the input/progress of the animal 102. For example, if the animal 102 routinely fails at the task provided by the enrichment application, the application can track such failures. When the animal 102 begins to improve, the application can also track the progress that the animal 102 has made. In this way the enrichment application can provide enrichment to the animal 102 and collect data regarding the intellectual capabilities of the animal 102. In some implementations, the enrichment application is configured to access a local WiFi network or other external network system. This WiFi network allows for the transfer of electronic data from the devices to a data management system. In other implementations, the enrichment apparatus 100 can be configured to connect to a WiFi network, Bluetooth network or other wireless network system to allow for configuration or exchange of data generated by the enrichment apparatus 100 to a central server, computing device, or operator device (e.g. smart phone). The exchange provides an operator a convenient means to manage and coordinate multiple enrichment apparatus 100 either simultaneously, collectively, or individually.

[0031] In some implementations, the enrichment application can be configured to allow interactions between humans and the animal 102. For example, a zoo-keeper or zoo-goer can download a compatible application to a smartphone or tablet or may use a provided computing device (e.g., tablet) to provide a stimulus to the animal 102 by way of the computing device 210. The animal 102 can respond to the stimulus. If successful, the enrichment apparatus 100 rewards the animal 102 with a treat. In this way, humans and

animals can interact without endangering either the animals or the humans. In some implementations, the enrichment application can be executed on the computing device 210 and a computing device accessible to the human (e.g., smartphone or tablet). In such implementations, the human and the animal 102 can play the same game or puzzle in direct comparison.

[0032] In some implementations, the enrichment application is configured to access a social media website. In these implementations, the progress of an animal 102 (e.g., a pet dog or cat) can be tracked by the owner of the animal 102 or other interested parties. Such implementations can allow pet owners to have their animals compete with one another.

[0033] FIG. 5 illustrates a method that can be executed by the enrichment application. At operation 510, the enrichment application provides a stimulus via the interface. As previously indicated the stimulus can be a visual stimulus and/or an audio stimulus. The stimulus may be a puzzle and/or a game. The stimulus can also vary in complexity. For instance, the stimulus that the animal 102 must repeat, and the length or complexity of the pattern can be increased to increase the stimulation of the animal 102.

[0034] At operation 512, the enrichment application receives input from the animal 102 via the interface 110. The input can be touch-based input and/or audio input. In some implementations, the enrichment application documents the input. For example, the enrichment application can store data indicating the stimulus that was presented and the response to the stimulus.

[0035] At operation 514, the enrichment application analyzes the input to determine if the input is correct. If the input is incorrect, the enrichment application determines whether the enrichment session is complete, as shown at operation 520. The duration of the enrichment session can be temporal (e.g., five minutes) or based on the number of iterations performed by the enrichment application (e.g., no more than five correct answers). If the session is complete, the enrichment application can stop executing. Otherwise, the enrichment application can present another stimulus.

[0036] If the animal 102 provides the correct input in response to the stimulus, the enrichment application can cause dispensing of the treat, as shown at operation 516. In some implementations, the enrichment application presents one or more light indicators 218 on the interface 110 that triggers the one or more sensors 228. The light indicators 218 can be arranged in a predetermined pattern, such that the light indicators 218 align with the light sensors 228. The duration of the treat dispensing can be set automatically or by a user. In some implementations, the light indicators 218 are kept on for the duration of the treat dispensing (e.g., five seconds). During the time which the light indicators 218 are displayed

on the interface 110, the one or more sensors 228 output a signal to the valve actuator 226, which opens the valve 224. While the valve 224 is open, the treat delivery system 220 dispenses treats to the animal 102.

[0037] At operation 518, the enrichment application can adjust the complexity of the stimulus. The foregoing operation can be implemented to ensure that the animal 102 is being challenged and that the stimulus is not too easy to solve. The enrichment application can continue to operate in this manner until the session is complete.

[0038] The operations presented in FIG. 5 are for example only and not intended to limit the operation of the enrichment application. It is noted that some of the operations are optional and not mandatory. For instance, the enrichment application does not need to increase in complexity each time the stimulus is correctly responded to.

[0039] FIG. 6 illustrates an alternative configuration of the enrichment apparatus 100 for a pet, domestic animal or farm animal. The enrichment apparatus includes a computing device 610, a support structure 612, a connection 614, and a treat delivery system 616. The treat delivery system 616 includes a fill door 618, an indicator 620, a camera 622, a dispenser 624, and a tray 626.

[0040] The computing device 610 is situated on the support structure 612. The support structure 612 may include a means for securing the computing device 610, such as adhesive, straps, or flanges. The angle of the support structure 612 may also be raised or lowered to provide appropriate access to a particular user. The computing device 610 includes an interface 602. The computing device 610 is in communication with the treat delivery system 616 by way of the connection 614. The treat delivery system 616 includes the fill door 618, the indicator 620, the camera 622, the dispenser 624 and the tray 626.

[0041] In operation, the computer device 610 presents a stimulus to the pet, domestic animal or farm animal. The support structure 612 remains upright and secures the computing device 610 while the device is in use. The computing device 610 may be any suitable device, such as a tablet, smartphone or laptop computer. The computing device 610 may include a touch screen, keyboard or buttons. The computing device 610 presents a stimulus to the pet, domestic animal or farm animal, and upon a correct response to the stimulus the computing device 610 sends a signal by way of the connection 614 to the treat delivery system 616 to release a treat. The connection 614 may be a wired connection or a wireless connection.

[0042] The correct response to the stimulus also may cause the computing device 610 to send a signal to activate the indicator 620 to provide some indication to the pet, domestic animal or farm animal. The indicator may include a sound-, light-, or scent-producing device to emit a predetermined sound, light, or olfactory pattern upon a correct response to the stimulus, an

incorrect response to the stimulus, or another programmable event. The correct response to the stimulus may also cause the computing device 610 to send a signal to activate or deactivate the camera 622. The camera 622 may be configured to take video or photographs. The camera 622 may be activated upon the occurrence of other events such as an incorrect response to the stimulus, the activation of the enrichment apparatus 100 or any other programmable event. The video or photographs may be sent to the computing device 610 to display or store. Alternatively, the video or photographs may be sent to an internet address for current or subsequent viewing. Once the treat delivery system 616 receives a signal to dispense a treat, a treat or treats exits the dispenser 624 and falls into the tray 626 where it is accessible to the pet, farm animal or domestic animal.

[0043] The treat delivery system 616 is accessed by a human controller through the fill door 618. The fill door 618 provides access to a treat reservoir for holding treats to be dispensed. The reservoir may hold liquid or solid treats. Treats may include pet food, water, juice, pet treats, or any other substance for ingestion. In some embodiments, the treat delivery system 616 may include a valve and a valve actuator (not shown). The valve actuator opens and closes the valve in response to a signal to release a treat. The valve may be situated such that when it is open, a treat or treats are released through the dispenser 624.

[0044] A "support structure" may be any structure used to support or position the computing device and interface. The support structure facilitates animal access to the computing device and interface. In facilitating animal access to the device and interface, the support structure secures the computing device and interface, and prevents movement while the computing device is in use. The support structure may be a housing, stand, casing, cover, table or any other structure that facilitates animal access to the computing device and interface.

[0045] Various implementations of the systems and techniques described here can be realized in digital electronic and/or optical circuitry, integrated circuitry, specially designed ASICs (application specific integrated circuits), computer hardware, firmware, software, and/or combinations thereof. These various implementations can include implementation in one or more computer programs that are executable and/or interpretable on a programmable system including at least one programmable processor, which may be special or general purpose, coupled to receive data and instructions from, and to transmit data and instructions to, a storage system, at least one input device, and at least one output device.

[0046] These computer programs (also known as programs, software, software applications or code) include machine instructions for a programmable processor, and can be implemented in a high-level procedural and/or object-oriented programming language, and/or in assembly/machine language. As used herein, the terms "machine-readable medium" and

"computer-readable medium" refer to any computer program product, non-transitory computer readable medium, apparatus and/or device (e.g., magnetic discs, optical disks, memory, Programmable Logic Devices (PLDs)) used to provide machine instructions and/or data to a programmable processor, including a machine-readable medium that receives machine instructions as a machine-readable signal. The term "machine-readable signal" refers to any signal used to provide machine instructions and/or data to a programmable processor.

[0047] Implementations of the subject matter and the functional operations described in this specification can be implemented in digital electronic circuitry, or in computer software, firmware, or hardware, including the structures disclosed in this specification and their structural equivalents, or in combinations of one or more of them. Moreover, subject matter described in this specification can be implemented as one or more computer program products, i.e., one or more modules of computer program instructions encoded on a computer readable medium for execution by, or to control the operation of, data processing apparatus. The computer readable medium can be a machine-readable storage device, a machine-readable storage substrate, a memory device, a composition of matter effecting a machine-readable propagated signal, or a combination of one or more of them. The terms "data processing apparatus", "computing device" and "computing processor" encompass all apparatus, devices, and machines for processing data, including by way of example a programmable processor, a computer, or multiple processors or computers. The apparatus can include, in addition to hardware, code that creates an execution environment for the computer program in question, e.g., code that constitutes processor firmware, a protocol stack, a database management system, an operating system, or a combination of one or more of them. A propagated signal is an artificially generated signal, e.g., a machine-generated electrical, optical, or electromagnetic signal, that is generated to encode information for transmission to suitable receiver apparatus.

[0048] A computer program (also known as an application, program, software, software application, script, or code) can be written in any form of programming language, including compiled or interpreted languages, and it can be deployed in any form, including as a stand-alone program or as a module, component, subroutine, or other unit suitable for use in a computing environment. A computer program does not necessarily correspond to a file in a file system. A program can be stored in a portion of a file that holds other programs or data (e.g., one or more scripts stored in a markup language document), in a single file dedicated to the program in question, or in multiple coordinated files (e.g., files that store one or more modules, sub programs, or portions of code). A computer program can be deployed to be

executed on one computer or on multiple computers that are located at one site or distributed across multiple sites and interconnected by a communication network.

[0049] The processes and logic flows described in this specification can be performed by one or more programmable processors executing one or more computer programs to perform functions by operating on input data and generating output. The processes and logic flows can also be performed by, and apparatus can also be implemented as, special purpose logic circuitry, e.g., an FPGA (field programmable gate array) or an ASIC (application specific integrated circuit).

[0050] Processors suitable for the execution of a computer program include, by way of example, both general and special purpose microprocessors, and any one or more processors of any kind of digital computer. Generally, a processor will receive instructions and data from a read only memory or a random access memory or both. The essential elements of a computer are a processor for performing instructions and one or more memory devices for storing instructions and data. Generally, a computer will also include, or be operatively coupled to receive data from or transfer data to, or both, one or more mass storage devices for storing data, e.g., magnetic, magneto optical disks, or optical disks. However, a computer need not have such devices. Moreover, a computer can be embedded in another device, e.g., a mobile telephone, a personal digital assistant (PDA), a mobile audio player, a Global Positioning System (GPS) receiver, to name just a few. Computer readable media suitable for storing computer program instructions and data include all forms of non-volatile memory, media and memory devices, including by way of example semiconductor memory devices, e.g., EPROM, EEPROM, and flash memory devices; magnetic disks, e.g., internal hard disks or removable disks; magneto optical disks; and CD ROM and DVD-ROM disks. The processor and the memory can be supplemented by, or incorporated in, special purpose logic circuitry.

[0051] To provide for interaction with a user, one or more aspects of the disclosure can be implemented on a computer having a display device, e.g., a CRT (cathode ray tube), LCD (liquid crystal display) monitor, or touch screen for displaying information to the user and optionally a keyboard and a pointing device, e.g., a mouse or a trackball, by which the user can provide input to the computer. Other kinds of devices can be used to provide interaction with a user as well; for example, feedback provided to the user can be any form of sensory feedback, e.g., visual feedback, auditory feedback, or tactile feedback; and input from the user can be received in any form, including acoustic, speech, or tactile input. In addition, a computer can interact with a user by sending documents to and receiving documents from a

device that is used by the user; for example, by sending web pages to a web browser on a user's client device in response to requests received from the web browser.

[0052] One or more aspects of the disclosure can be implemented in a computing system that includes a backend component, e.g., as a data server, or that includes a middleware component, e.g., an application server, or that includes a frontend component, e.g., a client computer having a graphical user interface or a Web browser through which a user can interact with an implementation of the subject matter described in this specification, or any combination of one or more such backend, middleware, or frontend components. The components of the system can be interconnected by any form or medium of digital data communication, e.g., a communication network. Examples of communication networks include a local area network ("LAN") and a wide area network ("WAN"), an inter-network (e.g., the Internet), peer-to-peer networks (e.g., ad hoc peer-to-peer networks), WiFi network, Bluetooth network and other wireless network system.

[0053] The computing system can include clients and servers. A client and server are generally remote from each other and typically interact through a communication network. The relationship of client and server arises by virtue of computer programs running on the respective computers and having a client-server relationship to each other. In some implementations, a server transmits data (e.g., an HTML page) to a client device (e.g., for purposes of displaying data to and receiving user input from a user interacting with the client device). Data generated at the client device (e.g., a result of the user interaction) can be received from the client device at the server.

[0054] While this specification contains many specifics, these should not be construed as limitations on the scope of the disclosure or of what may be claimed, but rather as descriptions of features specific to particular implementations of the disclosure. Certain features that are described in this specification in the context of separate implementations can also be implemented in combination in a single implementation. Conversely, various features that are described in the context of a single implementation can also be implemented in multiple implementations separately or in any suitable sub-combination. Moreover, although features may be described above as acting in certain combinations and even initially claimed as such, one or more features from a claimed combination can in some cases be excised from the combination, and the claimed combination may be directed to a sub-combination or variation of a sub-combination.

[0055] Similarly, while operations are depicted in the drawings in a particular order, this should not be understood as requiring that such operations be performed in the particular order shown or in sequential order, or that all illustrated operations be performed, to achieve

desirable results. In certain circumstances, multi-tasking and parallel processing may be advantageous. Moreover, the separation of various system components in the embodiments described above should not be understood as requiring such separation in all embodiments, and it should be understood that the described program components and systems can generally be integrated together in a single software product or packaged into multiple software products.

[0056] A number of implementations have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the disclosure. Accordingly, other implementations are within the scope of the following claims. For example, the actions recited in the claims can be performed in a different order and still achieve desirable results.

WHAT IS CLAIMED:

1. An apparatus comprising:

a housing defining an interface aperture;

a treat delivery system including a treat reservoir and a treat delivery mechanism, the treat delivery system receiving a signal and dispensing treats in response to the signal;

a computing device disposed within the housing, the computing device including an interface, the interface being adjacently disposed to the interface aperture and facing out of the housing;

wherein the computing device executes an enrichment application, the enrichment application being configured to present a stimulus to an animal via the interface and to receive input from the animal via the interface; and

wherein the signal is provided to the treat delivery system in response to the animal correctly responding to the stimulus.

2. The apparatus of claim 1, wherein:

the treat delivery system further includes one or more indicators that output an indication; and

the one or more indicators are configured to output a predetermined pattern in response to the animal correctly responding to the stimulus.

3. The apparatus of claim 2, wherein the indication is a predetermined light pattern.

4. The apparatus of claim 2, wherein the indication is a predetermined sound pattern.

5. The apparatus of claim 2, wherein the indication is a predetermined olfactory pattern.

6. The apparatus of claim 1, wherein the treat delivery system further includes:

a valve; and

a valve actuator that opens and closes the valve,

the valve actuator being responsive to the signal.

7. The apparatus of claim 6, wherein the value delivers a solid or liquid treat.

8. The apparatus of claim 7, wherein the treats are liquid.

9. The apparatus of claim 7, wherein the treats are solid.

10. The apparatus of claim 1, wherein the enrichment application receives configuration parameters and adjusts a complexity of the stimulus based on the configuration parameters.

11. The apparatus of claim 1, wherein the enrichment application is configured to store data corresponding to responses by the animal to the presented stimulus.

12. The apparatus of claim 1, wherein the computing device is a tablet computer and the interface is a touchscreen of the tablet computer.

13. The apparatus of claim 1, wherein the computing device is a laptop computer.

14. The apparatus of claim 1, wherein the computing device is a smartphone.

15. The apparatus of claim 1, wherein the computing device is a microcontroller.

16. The apparatus of claim 1, wherein the enrichment application is configured to increase the complexity of a next stimulus each time the animal correctly responds to a previous stimulus.

17. An apparatus comprising:

a support structure;

a treat delivery system including a treat reservoir and a treat delivery mechanism, the treat delivery system receiving a signal and dispensing treats in response to the signal;

a computing device in contact with the support structure, the computing device including an interface;

wherein the computing device executes an enrichment application, the enrichment application being configured to present a stimulus to an animal via the interface and to receive input from the animal via the interface; and

wherein the signal is provided to the treat delivery system in response to the animal correctly responding to the stimulus.

18. The apparatus of claim 17, wherein:

the treat delivery system further includes one or more indicators that output an indication; and

the one or more indicators are configured to output a predetermined pattern in response to the animal correctly responding to the stimulus.

19. The apparatus of claim 18, wherein the indication is a predetermined light pattern.

20. The apparatus of claim 18, wherein the indication is a predetermined sound pattern.

21. The apparatus of claim 18, wherein the indication is a predetermined olfactory pattern.

22. The apparatus of claim 17, wherein the treat delivery system further includes:

a valve; and

a valve actuator that opens and closes the valve,

the valve actuator being responsive to the signal.

23. The apparatus of claim 22, wherein the valve delivers a solid or liquid treat.

24. The apparatus of claim 23, wherein the treats are liquid.

25. The apparatus of claim 23, wherein the treats are solid.

26. The apparatus of claim 17, wherein the enrichment application receives configuration parameters and adjusts a complexity of the stimulus based on the configuration parameters.

27. The apparatus of claim 17, wherein the enrichment application is configured to store data corresponding to responses by the animal to the presented stimulus.

28. The apparatus of claim 17, wherein the computing device is a tablet computer and the interface is a touchscreen of the tablet computer.

29. The apparatus of claim 17, wherein the computing device is a laptop computer.

30. The apparatus of claim 17, wherein the computing device is a smartphone.

31. The apparatus of claim 17, wherein the computing device is a microcontroller.

32. The apparatus of claim 17, wherein the enrichment application is configured to increase the complexity of a next stimulus each time the animal correctly responds to a previous stimulus.

33. A method of enriching an environment of an animal, the method comprising:
presenting a stimulus via an interface of a computing device;
receiving input via the interface;
determining whether the input was a correct response to the stimulus; and
when the input was the correct response, causing a treat delivery system to dispense treats for a predetermined duration.

34. The method of claim 33, further comprising:
increasing a complexity of a next stimulus when the input to the stimulus was the correct response; and
presenting the next stimulus via the interface.

35. The method of claim 33, wherein causing the treat delivery system to dispense treats for a predetermined duration includes emitting a predetermined indication via an indicator for the predetermined duration.

36. The method of claim 35, wherein the treat delivery system includes one or more sensors outputting a signal in response to the indicator, the one or more sensors being electronically coupled to a valve actuator, the valve actuator being responsive to the signal.

37. The method of claim 36, wherein the sensor is a light sensor.

38. The method of claim 36, wherein the sensor is a sound sensor.

39. The method of claim 36, further comprising opening, by the valve actuator, a valve coupled to a treat reservoir in response to the signal.

40. The method of claim 36, wherein the animal is not restrained into a user position within the enriching environment.

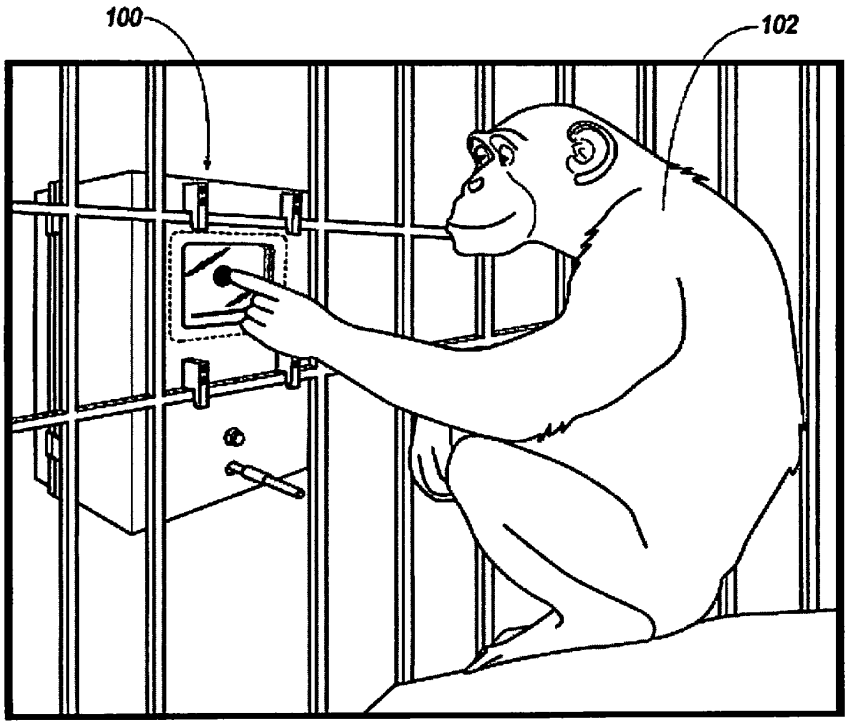


FIG. 1

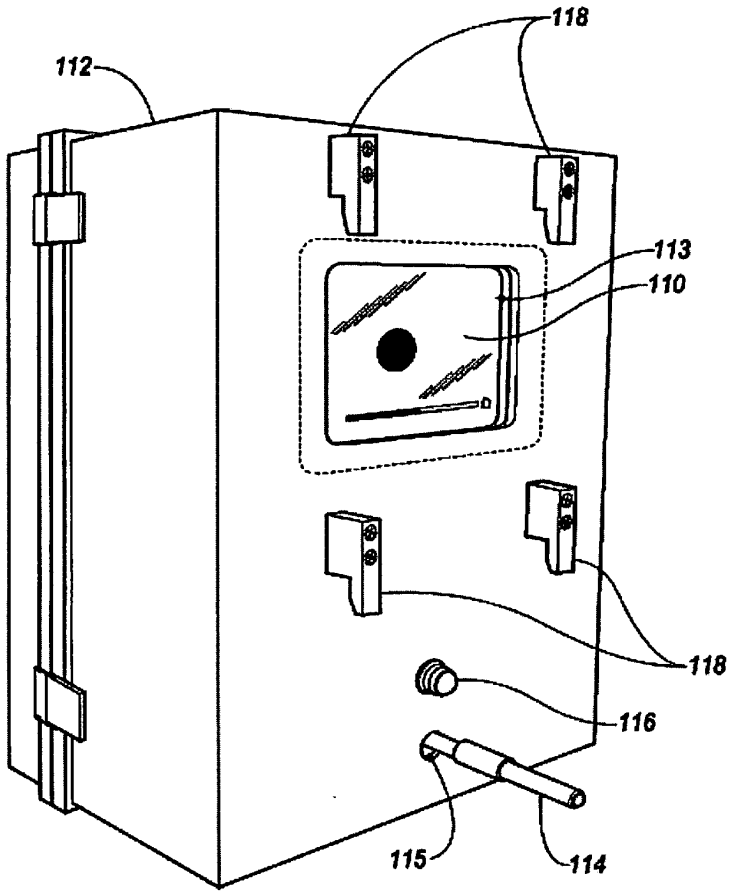
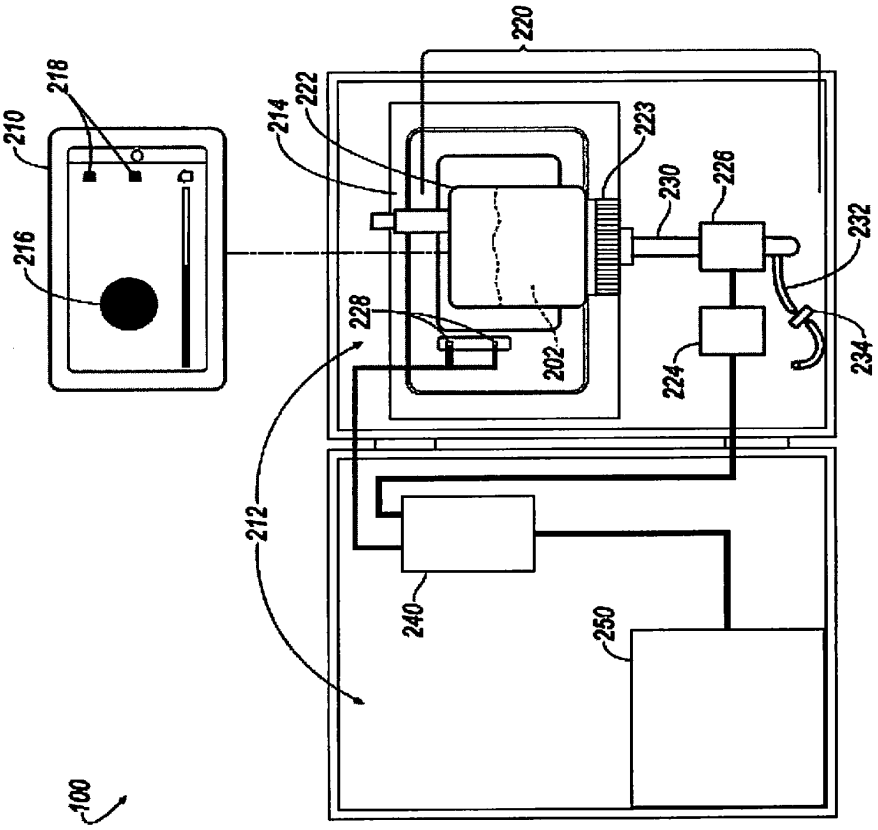


FIG. 2

FIG. 3


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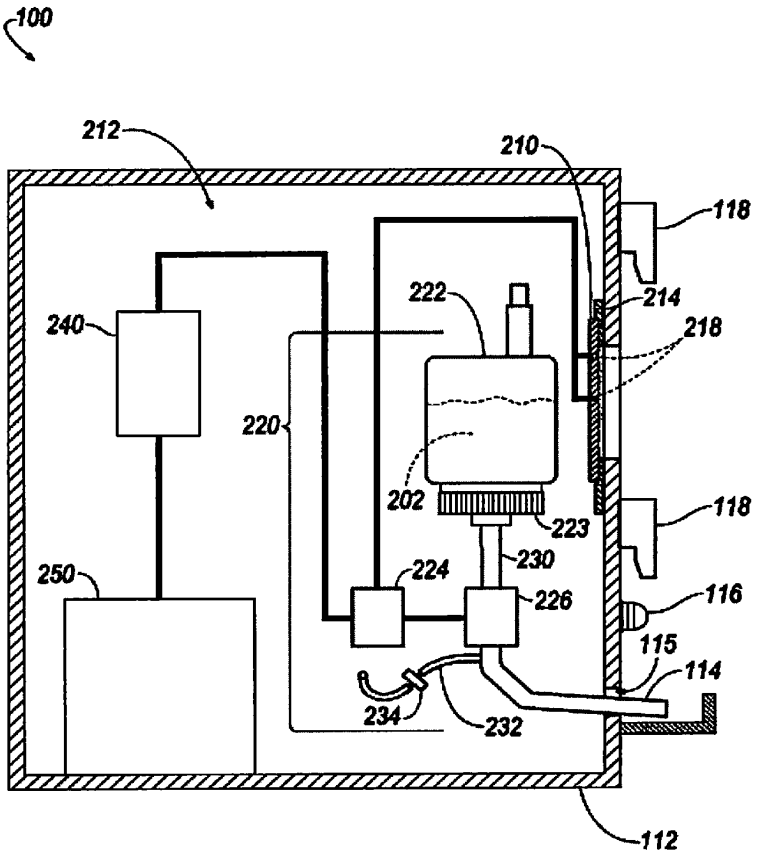

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FIG. 4

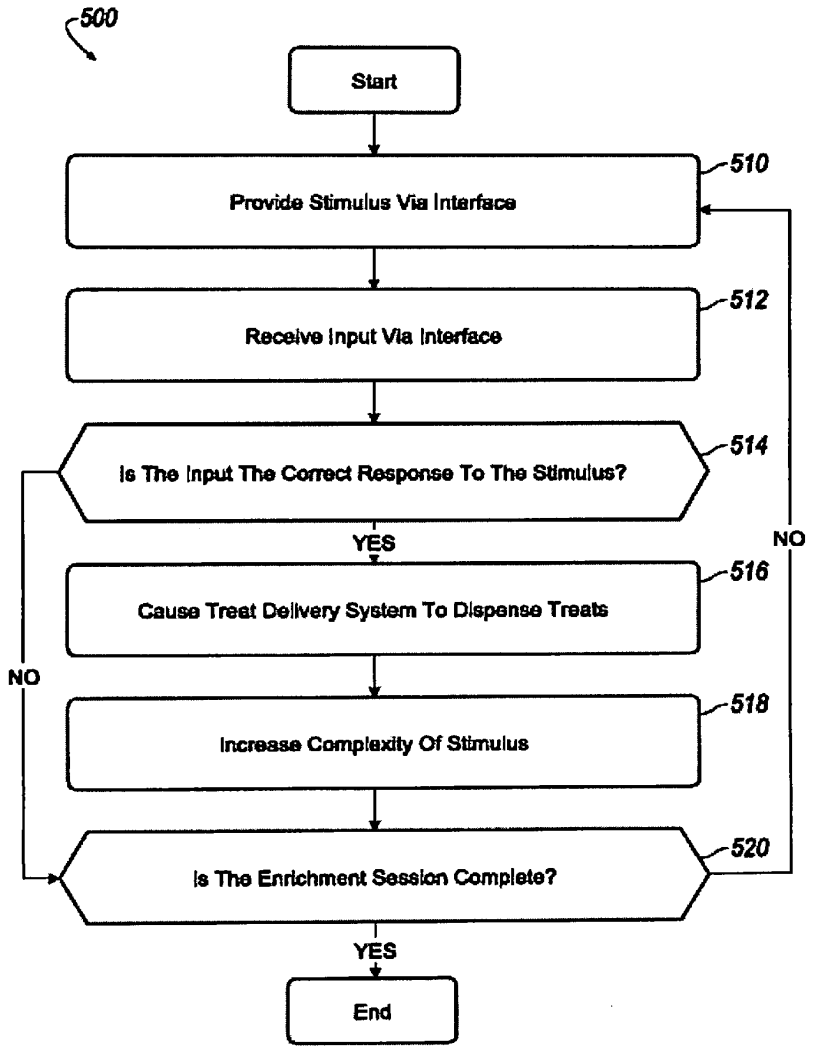

500
Start
Provide Stimulus Via Interface
510
Receive Input Via Interface
512
Is The Input The Correct Response To The Stimulus?
514
YES
NO
Cause Treat Delivery System To Dispense Treats
516
NO
Increase Complexity Of Stimulus
518
Is The Enrichment Session Complete?
520
YES
End

FIG. 5

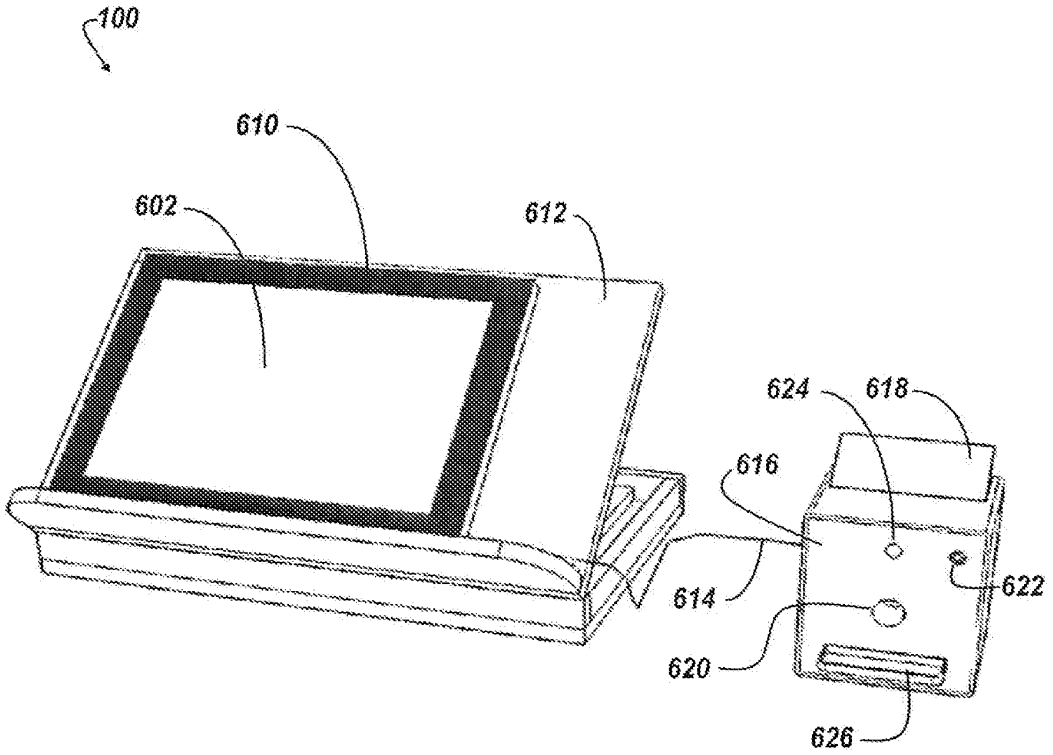


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/012567

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01K1/03 A01K5/02 A01K15/02
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A01K

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012/077159 A1 (ARAUJO JOSEPH [CA]) 29 March 2012 (2012-03-29) abstract; claims 1-22; figures 1-6 paragraphs [0001] - [0117] -----	1-40
X	US 2012/240863 A1 (ARAUJO JOSEPH [CA]) 27 September 2012 (2012-09-27) abstract; claims 1-20; figures 1-11 paragraphs [0001] - [0141] ----- -/--	1-9, 11-15, 17-25, 27-31, 33,35-40

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 April 2015	13/04/2015

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Rojo Galindo, Ángel

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/012567

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/028327 A1 (BRUNNER DANIELA [US] ET AL) 6 February 2003 (2003-02-06) abstract; claims 1-32; figures 1-16 paragraphs [0002] - [0354]	1-9,11, 13-15, 17-25, 27, 29-31, 33-40
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A	CN 103 125 406 A (UNIV ZHENGZHOU) 5 June 2013 (2013-06-05) the whole document	1-40
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2015/012567

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		WO 2012119321 A1	13-09-2012
CN 103125406 A	05-06-2013	NONE	
GB 1287304 A	31-08-1972	NONE	

Electronic Acknowledgement Receipt	
EFS ID:	39628070
Application Number:	15775706
International Application Number:	
Confirmation Number:	3566
Title of Invention:	System and Method of Determining the Health and Gender of a Chick
First Named Inventor/Applicant Name:	Ramin Karimpour
Customer Number:	90741
Filer:	Kathleen M. Lynch/Abigail Jordan
Filer Authorized By:	Kathleen M. Lynch
Attorney Docket Number:	374-2
Receipt Date:	04-JUN-2020
Filing Date:	11-MAY-2018
Time Stamp:	15:00:50
Application Type:	U.S. National Stage under 35 USC 371

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	Information Disclosure Statement (IDS) Form (SB08)	673-06-UTIL_2020-06-04_IDSklex.pdf	68055 34fc8fb29c9ffd8d1abf4cc0cf4d341a0a2fac a1	no	5

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2	Non Patent Literature	2020JUNE_SIDS_NPL5_20200312-943EPCCommunication.pdf	185316 071cb4ff187713098912b5735b3000b79774913a	no	6
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3	Foreign Reference	WO2012008843-PAMPH-20120119-7511.pdf	1326186 0042e8a769f2e1033d52dedea5ce982653780516	no	28
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4	Foreign Reference	WO2015112786-PAMPH-20150730-1547.pdf	1138354 745464920128980a905084c3c10d18aaaca0f346	no	28
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5	Non Patent Literature	2020JUNE_SIDS_NPL1_20200403-RussiaOA.pdf	403777 eaa626b79aed4ed0ee8ac81ea10a72f8118ad22b	no	8
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6	Non Patent Literature	2020JUNE_SIDS_NPL2_EngTransRussiaOA.pdf	180458 d2c514777d9b99c006d37cf77d3cf5a7a3bd03a1	no	8
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8	Non Patent Literature	2020JUNE_SIDS_NPL4_20200603-EngSummExamRptPID20180.pdf	254748 764835d64c446c55b1d154a7318db46557952d1c	no	2
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/775,706	05/11/2018	Ramin Karimpour	374-2	3566

90741 7590 04 23/2020

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POPOVICI, DOV

ART UNIT	PAPER NUMBER
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NOTIFICATION DATE	DELIVERY MODE
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Applicant : Karimpour
Filing Date : 05/11/2018
Date Mailed : 04/23/2020

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Notice of Allowance Mailed

This application has been accorded an Allowance Date and is being prepared for issuance. The application, however, is incomplete for the reasons below.

Applicant is given two (2) months from the mail date of this Notice within which to respond. This time period for reply is extendable under 37 CFR 1.136(a) for only TWO additional MONTHS.

The application is not in compliance with 37 CFR 1.78, as indicated in the attachment. The consequences of failure to respond within the above-identified time period are set forth in the attachment.

Even if the Office has recognized a benefit claim and has entered it into the Office's database and included it on applicant's filing receipt, the benefit claim is not a proper benefit claim unless the reference in compliance with 37 CFR 1.78 is included, depending upon the application's filing date and as indicated in the attachment, in an application data sheet or in the first sentence(s) of the specification and all other requirements are met.

See attachment.

A copy of this notice MUST be returned with the reply. Please address response to "Mail Stop Issue Fee, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450".

/Quang Nguyen/
Publication Branch
Office of Data Management
(571) 272-4200

Application No. 15775706

APPLICATION FILED ON OR AFTER SEPTEMBER 16, 2012,
NOT IN COMPLIANCE WITH 37 CFR 1.78

☐ The 37 CFR 1.78(d)(2) reference on the application data sheet does not indicate the relationship (continuation, division, continuation-in-part) to the prior U.S. nonprovisional application or international application designating the U.S. See document coded dated , listing application number(s) .

☐ The 37 CFR 1.78(d)(2) reference on the application data sheet does not indicate the relationship (continuation, division, continuation-in-part) to the prior international application designating the U.S. but instead indicates that an application is the national stage of the prior international application. However, the application was filed as a 35 U.S.C. 111 application and was not processed as a 35 U.S.C. 371 application, thus removing the validating link under 35 U.S.C. 119(a)-(d) to a prior foreign application or under 35 U.S.C. 119(e) to a prior U.S. provisional application. See document coded dated , listing application number(s) .

☐ The 37 CFR 1.78(d)(2) reference on the application data sheet does not provide the U.S. nonprovisional application number (series code and serial number) or, with respect to an international PCT application designating the U.S., it provides the international application number or international filing date but not both. See document coded dated , in which the following is missing: .

☒ The 37 CFR 1.78(d)(2) reference on the application data sheet shows an incorrect, incomplete, or illegible U.S. nonprovisional application number, international PCT application number, or international PCT filing date. See document coded ADS dated 05/11/2018 , in which the following error was made: 11/11/2017 (PCT filing date) instead of 11/11/2016.

☐ The 37 CFR 1.78(d)(2) reference to the prior U.S. nonprovisional application or international application designating the U.S. is not present on an application data sheet, thus removing the validating link under 35 U.S.C. 119(a)-(d) to a prior foreign application or under 35 U.S.C. 119(e) to a prior U.S. provisional application. See document coded dated , in which the following is missing: .

☐ The 37 CFR 1.78(d)(2) reference to the prior U.S. nonprovisional application or international application designating the U.S. is not present on an application data sheet.

☐ The 37 CFR 1.78(a)(3) reference to the prior U.S. provisional application is not present on an application data sheet.

☐ The 37 CFR 1.78(a)(3) reference to the prior U.S. provisional application on an application data sheet does not provide the provisional application number (series code and serial number). See document coded dated , in which the following is missing: .

☐ The 37 CFR 1.78(a)(3) reference to the prior U.S. provisional application on an application data sheet shows an incorrect, incomplete, or illegible U.S. provisional application number. See document coded dated , in which the following error was made: .

☐ Other: .

HOW TO RESPOND

A proper response to this notice would include any one of: (1) a corrected Application Data Sheet (ADS) pursuant to 37 CFR 1.76(c) which provides benefit information that complies with 37 CFR 1.78(d)(2) or 37 CFR 1.78(a)(3) or (2) a petition filed pursuant to the provisions of 37 CFR 1.78(e) or 37 CFR 1.78(c) if the benefit information from the document identified above by code and date does not accurately reflect the benefits under 35 U.S.C. 119(e), 120, 121, 365(c) or 386(c) as claimed by applicant (a grantable petition would include a corrected ADS pursuant to 37 CFR 1.76(c)). In general, a petition would be required unless the proper benefit claim information was included on a properly signed ADS submitted with the application on filing, or a properly signed corrected ADS in compliance with 37 CFR 1.76(c) (e.g., with underlining to show insertions) that was filed within the time period in 37 CFR 1.78 for making the benefit claim(s), or the Office recognized the benefit claim(s) on the initial filing receipt. Such response may be filed after payment of the issue fee if limited to informalities noted herein. See Waiver of 37 CFR 1.312 for Document Required by Office of Patent Publication, 1280 Off. Gaz. Patent Office 918 (March 23, 2004).

WARNING: If Applicant fails to timely submit a proper response, the benefit information will be deleted and the patent will be printed without the benefit information present.

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
15/775,706	05/11/2018	2677	650	374-2	21	3

CONFIRMATION NO. 3566

CORRECTED FILING RECEIPT

90741
Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518



Date Mailed: 04/20/2020

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)

Ramin Karimpour, Raleigh, NC;

Applicant(s)

Applied LifeSciences and Systems, LLC, Raleigh, NEW CALEDONIA

Assignment For Published Patent Application

Applied LifeSciences and Systems, LLC, Raleigh, NC

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/US2016/061536 11/11/2016
which claims benefit of 62/349,981 06/14/2016
and claims benefit of 62/254,737 11/13/2015

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

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.

If Required, Foreign Filing License Granted: 08/30/2018

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/775,706**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

System and Method of Determining the Health and Gender of a Chick

Preliminary Class

382

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 AssetsControl, 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.

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

90741 7590 03/06/2020

Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518

EXAMINER	
POPOVICI, DOV	
ART UNIT	PAPER NUMBER
2677	

DATE MAILED: 03/06/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/775,706	05/11/2018	Ramin Karimpour	374-2	3566

TITLE OF INVENTION: System and Method of Determining the Health and Gender of a Chick

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	06/08/2020

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 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity 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 and an extra copy of the form should be submitted. 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)

90741 7590 03/06/2020

Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518

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.

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.
15/775,706	05/11/2018	Ramin Karimpour	374-2	3566

TITLE OF INVENTION: System and Method of Determining the Health and Gender of a Chick

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	06/08/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
POPOVICI, DOV	2677	382-110000

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/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 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,
(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.

1 _____
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. _____

Exhibit 1002 (page 120)

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.
15/775,706	05/11/2018	Ramin Karimpour	374-2	3566

90741 7590 03/06/2020

Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518

EXAMINER	
POPOVICI, DOV	
ART UNIT	PAPER NUMBER
2677	

DATE MAILED: 03/06/2020

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. 15/775,706	Applicant(s) Karimpour, Ramin	
	Examiner DOV POPOVICI	Art Unit 2677	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 the amendment filed on 05 February 2020.
   ☐ 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 1-3, 9-10, 14, 21 and 24-34, renumbered as claims 1-18 . 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. 20200228.
5. ☑ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/DOV POPOVICI/
Primary Examiner, Art Unit 2677

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 Interpretation

The following is a quotation of 35 U.S.C. 112(f):

> (f) Element in Claim for a Combination. – An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The following is a quotation of pre-AIA 35 U.S.C. 112, sixth paragraph:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The claims in this application are given their broadest reasonable interpretation using the plain meaning of the claim language in light of the specification as it would be understood by one of ordinary skill in the art. The broadest reasonable interpretation of a claim element (also commonly referred to as a claim limitation) is limited by the description in the specification when 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is invoked.

As explained in MPEP § 2181, subsection I, claim limitations that meet the following three-prong test will be interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph:

(A) the claim limitation uses the term "means" or "step" or a term used as a substitute for "means" that is a generic placeholder (also called a nonce term or a non-structural term having no specific structural meaning) for performing the claimed function;

(B) the term "means" or "step" or the generic placeholder is modified by functional language, typically, but not always linked by the transition word "for" (e.g., "means for") or another linking word or phrase, such as "configured to" or "so that"; and

(C) the term "means" or "step" or the generic placeholder is not modified by sufficient structure, material, or acts for performing the claimed function.

Use of the word "means" (or "step") in a claim with functional language creates a rebuttable presumption that the claim limitation is to be treated in accordance with 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim limitation is interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when the claim limitation recites sufficient structure, material, or acts to entirely perform the recited function.

Absence of the word "means" (or "step") in a claim creates a rebuttable presumption that the claim limitation is not to be treated in accordance with 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim limitation is not interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when the claim limitation recites function without reciting sufficient structure, material or acts to entirely perform the recited function.

Claim limitations in this application that use the word "means" (or "step") are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action. Conversely, claim limitations in this application that do not use the word "means" (or "step") are not being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action.

This application includes one or more claim limitations that do not use the word "means," but are nonetheless being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, because the claim limitation(s) uses a generic placeholder that is coupled with functional language without reciting sufficient structure to perform the recited function and the generic placeholder is not preceded by a structural modifier. Such claim limitation(s) is/are: **removing means**, in claim **21**.

Figure 2 shows first angled conveyor 20 (see page 8, lines 9-15) and the second angled conveyor 38 (see page 9, lines 6-17), is/are interpreted to read on: **removing means** in claim **21**.

Because this/these claim limitation(s) is/are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, it/they is/are being interpreted to cover the corresponding structure described in the specification as performing the claimed function, and equivalents thereof.

If applicant does not intend to have this/these limitation(s) interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, applicant may: (1) amend the claim limitation(s) to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph (e.g., by reciting sufficient structure to perform the

claimed function); or (2) present a sufficient showing that the claim limitation(s) recite(s) sufficient structure to perform the claimed function so as to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an interview with **Kathleen M. Lynch** (Reg. No. 33,957) on **2/28/2020**.

The application has been amended as follows:

In the claims:

In claim 2, line 1, change "1further" to --1 further--.

In claim 2, line 2, before "moving platform", insert --the--.

In claim 2, line 3, before "computer processor", insert --the--.

In claim 3, line 1, change "stimulus" to --stimuli--.

In claim 9, line 9, after "computerized", insert --image--.

In claim 14, line 1, change “removal” to --removing--.

In claim 21, line 3, after “chick”, insert --of a particular breed--.

In claim 25, line 2, delete “digital”.

In claim 26, line 3, delete “level of”.

In claim 26, line 3, change “a chick” to --the image of the chick--.

In claim 28, line 1, change “stimulus” to --stimuli--.

In claim 31, line 1, before “angle”, insert --the--.

In claim 32, line 2, before “determines”, insert --processor--.

In claim 32, line 3, after “chick’s sex”, insert --and determines which sex will remain on the moving platform--.

In claim 32, line 5, change “the-predetermined sex remaining” to --the determined sex remaining--.

In claim 33, line 3, before “deviation”, change “a” to --the--.

In claim 33, line 4, before “detected”, change “a” to --the--.

Reasons for Allowance

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

Claims 1-3, 9-10, 14, 21 and 24-34 are allowable for the reasons stated in applicant remarks, dated 05 February 2020, in pages 7-19.

The closest prior art of record, namely, Tao et al. (US 6,396,938 B1), Yavnai et al. (US 2001/0035370 A1), and/or Yakov Gershman, Non Patent Literature Document, entitled "A simple way to determine the sex of one-day poultry chickens (basic principles)", do not disclose, teach or suggest, a moving platform to support an unrestrained chick of a particular breed; and a computer processor having a database of images of male and female wing patterns for the particular breed, the computer processor in communication with the image capture device, whereby the image capture device captures at least one image of the chick and transmits it to the computer processor where the image is processed and compared to the database to determine the sex, as recited in independent claim 1.

Claims 2-3, 14 and 32 are allowable because they are dependent on allowable independent claim 1 above.

The closest prior art of record, namely, Tao et al. (US 6,396,938 B1), Yavnai et al. (US 2001/0035370 A1), and/or Yakov Gershman, Non Patent Literature Document, entitled "A simple way to determine the sex of one-day poultry chickens (basic principles)", do not disclose, teach or suggest, a moving platform upon which an unrestrained chick is supported; and the computerized image processor having access to a database of images of healthy and unhealthy chicks of the same breed, whereby

the image capture device captures at least one image of the chick, and it is transmitted to the computerized image processor where the computerized image processor compares the at least one image of the chick to the database of images to detect a deviation from the database of images, as claimed in independent claim 9.

Claims 10 and 33 are allowable because they are dependent on allowable independent claim 9 above.

The closest prior art of record, namely, Tao et al. (US 6,396,938 B1), Yavnai et al. (US 2001/0035370 A1), and/or Yakov Gershman, Non Patent Literature Document, entitled "A simple way to determine the sex of one-day poultry chickens (basic principles)", do not disclose, teach or suggest, a moving platform to support an unrestrained chick of a particular breed; the computer processor having a database of images of a predetermined feature of a chick therein, the computer processor capable of processing images and determining deviation from the database of images; and removing means for removing a chick from the moving platform, the removing means in communication with the computer processor, whereby when the image capture device takes an image of the chick and transmits it to the computer processor, the computer processor processes the image and determines any deviation of the image from the database of images, if a deviation is detected, the computer processor communicates with the removing means to remove the chick from the moving platform, as recited in independent claim 21.

Claims 24-31 and 34 are allowable because they are dependent on allowable independent claim 21 above.

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 inquiry concerning this communication or earlier communications from the examiner should be directed to DOV POPOVICI whose telephone number is (571)272-4083. The examiner can normally be reached on Monday - Friday 8:00 am- 4:30 pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, TAMMY GODDARD can be reached on 571-272-7773. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private

PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DOV POPOVICI/
Primary Examiner, Art Unit 2677

Examiner-Initiated Interview Summary	Application No. 15/775,706	Applicant(s) Karimpour, Ramin	
	Examiner DOV POPOVICI	Art Unit 2677	AIA (FITF) Status Yes

All participants (applicant, applicant's representative, PTO personnel):

(1) DOV POPOVICI. (3) _____.

(2) Kathleen M. Lynch (Reg. No. 33,957). (4) _____.

Date of Interview: 28 February 2020.

Type: ☑ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☑ No.
If Yes, brief description: _____.

Issues Discussed ☐ 101 ☑ 112 ☐ 102 ☐ 103 ☑ Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: 2-3,9,14,21,25-26,28 and 31-33.

Identification of prior art discussed: None.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

See Continuation Sheet.

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

	/DOV POPOVICI/ Primary Examiner, Art Unit 2677

Continuation of Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments:
An examiner's amendment was discussed and agreed to. Claims 2-3, 9, 14, 21, 25-26, 28 and 31-33 are amended for clarity purpose, and/or, in order to better clarify the claims over 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, issues, and/or, claim objections issues, by providing, and /or, correcting antecedent basis issues in the claims, and correcting typographical errors (see the attached examiner's amendment for more specific details). The application has been amended as follows: In the claims: In claim 2, line 1, change “1further” to --1 further--. In claim 2, line 2, before “ moving platform”, insert --the--. In claim 2, line 3, before “computer processor”, insert --the--. In claim 3, line 1, change “stimulus” to --stimuli--. In claim 9, line 9, after “computerized”, insert --image--. In claim 14, line 1, change “removal” to --removing--. In claim 21, line 3, after “chick”, insert --of a particular breed--. In claim 25, line 2, delete “digital”. In claim 26, line 3, delete “level of”. In claim 26, line 3, change “a chick” to --the image of the chick--. In claim 28, line 1, change “stimulus” to --stimuli--. In claim 31, line 1, before “angle”, insert --the--. In claim 32, line 2, before “determines”, insert --processor--. In claim 32, line 3, after “chick’s sex”, insert --and determines which sex will remain on the moving platform--. In claim 32, line 5, change “the-predetermined sex remaining” to --the determined sex remaining--. In claim 33, line 3, before “deviation”, change “a” to --the--. In claim 33, line 4, before “detected”, change “a” to --the--.

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/775,706	Karimpour, Ramin
	Examiner	Art Unit
	DOV POPOVICI	2677

CPC						
Symbol					Type	Version
A01K	/	13	/	003	F	2013-01-01
A01K	/	45	/	00	I	2013-01-01
A61B	/	5	/	43	I	2013-01-01
A61D	/	7	/	00	I	2013-01-01
A61B	/	5	/	70	I	2013-01-01
A61B	/	5	/	0033	I	2013-01-01
G16H	/	50	/	20	I	2018-01-01
A61D	/	17	/	00	I	2013-01-01
A61D	/	19	/	00	I	2013-01-01
A61D	/	1	/	025	I	2013-01-01
B65G	/	15	/	30	I	2013-01-01
A61B	/	5	/	0077	I	2013-01-01
A61B	/	5	/	7282	I	2013-01-01
A61D	/	3	/	00	I	2013-01-01
G06T	/	7	/	001	I	2013-01-01
A01K	/	61	/	13	I	2017-01-01
G16H	/	20	/	17	I	2018-01-01
A61M	/	5	/	30	I	2013-01-01
A61M	/	5	/	427	I	2013-01-01
A61B	/	2503	/	40	A	2013-01-01
A61B	/	2576	/	00	A	2013-01-01
Y02A	/	90	/	26	A	2018-01-01
B65G	/	2201	/	02	A	2013-01-01
G06T	/	2207	/	30128	A	2013-01-01
A61M	/	2250	/	00	A	2013-01-01

CPC Combination Sets							
Symbol					Type	Set	Ranking	Version
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	18	
/DOV POPOVICI/ Primary Examiner, Art Unit 2677	02 March 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	6

U.S. Patent and Trademark Office — Part of Paper No.: 20200228

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/775,706	Karimpour, Ramin
	Examiner	Art Unit
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INTERNATIONAL CLASSIFICATION					
CLAIMED					
A01K13/00	/	13	/	00	

NON-CLAIMED					
A01K45/00	/	45	/	00	

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
382	110

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					
382	100					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	18	
/DOV POPOVICI/ Primary Examiner, Art Unit 2677	02 March 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	6

U.S. Patent and Trademark Office — Part of Paper No.: 20200228

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	Examiner	Art Unit
	DOV POPOVICI	2677

☐ 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
1	1	7	10		19	15	28								
2	2		11		20	16	29								
3	3		12	9	21	17	30								
	4		13		22	18	31								
	5	5	14		23	4	32								
	6		15	10	24	8	33								
	7		16	11	25	13	34								
	8		17	12	26										
6	9		18	14	27										

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	18	
/DOV POPOVICI/ Primary Examiner, Art Unit 2677	02 March 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	6

U.S. Patent and Trademark Office Part of Paper No.: 20200228

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/775,706	Karimpour, Ramin
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✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

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

CLAIM		DATE								
Final	Original	11/01/2019	03/02/2020							
1	1	✓	=							
2	2	✓	=							
3	3	✓	=							
	4	-	-							
	5	-	-							
	6	-	-							
	7	✓	-							
	8	✓	-							
6	9	✓	=							
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17	30	✓	=							
18	31	✓	=							
4	32	✓	=							
8	33	✓	=							
13	34	✓	=							

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/775,706	Karimpour, Ramin
	Examiner	Art Unit
	DOV POPOVICI	2677

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

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

	/DOV POPOVICI/ Primary Examiner, Art Unit 2677

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
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Search Notes		
Search Notes	**Date**	**Examiner**
"((A01K13/003 OR A01K45/00 OR A01K61/13 OR A61B2503/40 OR A61B2576/00 OR A61B5/0033 OR A61B5/0077 OR A61B5/43 OR A61B5/70 OR A61B5/7282 OR A61D17/00 OR A61D19/00 OR A61D1/025 OR A61D3/00 OR A61D7/00 OR A61M2250/00 OR A61M5/30 OR A61M5/427 OR B65G15/30 OR B65G2201/02 OR G06T2207/30128 OR G06T7/001 OR G16H20/17 OR G16H50/20 OR Y02A90/26).CPC.) (limited by text search, see attached East Search History)"	02/28/2020	/D.P./
"382/110,100 (limited by text search, see attached East Search History)"	02/28/2020	/D.P./
East Search and East Search Updated - See attached East Search History	02/28/2020	/D.P./
Inventor Name Search Updated - See attached East Search History	02/28/2020	/D.P./
"((A01K45/00 OR A01K13/003 OR A01K61/13 OR A01K29/005 OR A01K45/007 OR A61D7/00 OR A61D17/00 OR A61D19/00 OR A61D1/025 OR A61D3/00 OR A61B2503/40 OR A61B2576/00 OR A61B5/0033 OR A61B5/0077 OR A61B5/43 OR A61B5/70 OR A61B5/7282 OR A61B5/0036 OR A61M2250/00 OR A61M5/30 OR A61M5/427 OR B65G15/30 OR B65G2201/02 OR G06T2207/30128 OR G06T7/001 OR G16H20/17 OR G16H50/20 OR Y02A90/26 OR G16Z99/00 OR H04N2201/0081).CPC.)	02/28/2020	/D.P./

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
Inventor Name Search Updated - See attached East Search History		02/28/2020	/D.P./
See attached East Search History		02/28/2020	/D.P./

	/DOV POPOVICI/ Primary Examiner, Art Unit 2677

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
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S4	1	("20090000915").PN.	US-PGPUB	OR	OFF	2019/10/29 07:22
S5	1	("20140069336").PN.	US-PGPUB	OR	OFF	2019/10/29 07:23
S6	1	("20140155756").PN.	US-PGPUB	OR	OFF	2019/10/29 07:23
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S8	1	("5101767").PN.	USPAT	OR	OFF	2019/10/29 07:57
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S20	1	("6396938").PN.	USPAT	OR	OFF	2019/10/29 10:35
S21	1	("6512839").PN.	USPAT	OR	OFF	2019/10/29 10:36
S22	1	("8019125").PN.	USPAT	OR	OFF	2019/10/29 10:37
S23	1	("9179651").PN.	USPAT	OR	OFF	2019/10/29 10:37
S24	1	"15775706"	US-PGPUB; USPAT	OR	OFF	2019/10/29 10:39
S25	1	"15775706" and (calculat$5 with deviat$5)	US-PGPUB; USPAT	OR	ON	2019/10/29 10:41
S26	239	(determin$5 with sex with chick$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2019/10/29 10:42

			IBM_TDB			
S27	3	(determin$5 with sex with chick$5) and (mov$3 with platform)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 10:44
S28	154	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 10:46
S29	56	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (camera or (image with captur$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 10:47
S30	20	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (camera or (image with captur$4)) and (database)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 10:48
S31	3	(determin$5 with sex with chick$5) and	US-PGPUB;	OR	ON	2019/10/29 10:49

		(stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (camera or (image with captur$4)) and (database) and (wing with pattern$4)	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S32	3	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (camera or (image with captur$4)) and (database) and (wing$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 10:49
S33	1	"20010035370" and (process$5)	US-PGPUB; USPAT	OR	ON	2019/10/29 16:01
S34	3	"09416262"	US-PGPUB; USPAT	OR	ON	2019/10/29 16:15
S35	1	(determin$5 with sex with chick$5) and (deviat$5 with image)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 16:46
S36	2	"15775706"	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2019/10/29 16:47

			EPO; JPO; DERWENT; IBM_TDB			
S37	131792	((A01K13/003 OR A01K45/00 OR A01K61/13 OR A61B2503/40 OR A61B2576/00 OR A61B5/0033 OR A61B5/0077 OR A61B5/43 OR A61B5/70 OR A61B5/7282 OR A61D17/00 OR A61D19/00 OR A61D1/025 OR A61D3/00 OR A61D7/00 OR A61M2250/00 OR A61M5/30 OR A61M5/427 OR B65G15/30 OR B65G2201/02 OR G06T2207/30128 OR G06T7/001 OR G16H20/17 OR G16H50/20 OR Y02A90/26).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 16:48
S38	1863	382/110	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 16:49
S39	133416	S37 or S38	US-	OR	ON	2019/10/29

			PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			16:49
S40	239	(determin$5 with sex with chick$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 16:49
S41	43	S39 and S40	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 16:49
S42	154	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 09:48
S43	131854	((A01K13/003 OR A01K45/00 OR A01K61/13 OR A61B2503/40 OR A61B2576/00 OR	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2019/10/31 09:48

		A61B5/0033 OR A61B5/0077 OR A61B5/43 OR A61B5/70 OR A61B5/7282 OR A61D17/00 OR A61D19/00 OR A61D1/025 OR A61D3/00 OR A61D7/00 OR A61M2250/00 OR A61M5/30 OR A61M5/427 OR B65G15/30 OR B65G2201/02 OR G06T2207/30128 OR G06T7/001 OR G16H20/17 OR G16H50/20 OR Y02A90/26).CPC.)	EPO; JPO; DERWENT; IBM_TDB			
S44	1863	382/110	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 09:48
S45	133478	S43 or S44	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 09:48
S46	28	S45 and S42	US-	OR	ON	2019/10/31

			PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			09:48
S47	193	(sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (deviat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 09:53
S48	15	(sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (deviat$5) and S45	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 09:53
S49	239	(determin$5 with sex with chick$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 09:55
S50	43	S45 and S49	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2019/10/31 09:55

			EPO; JPO; DERWENT; IBM_TDB			
S51	56	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (camera or (image with captur$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:19
S52	18	S45 and S51	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:19
S53	20	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (camera or (image with captur$4)) and (database)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:20
S54	10	S45 and S53	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:20

S55	1	(sex with chick$5) and ((stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) with wing$4) and (deviat$5) and S45	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:46
S56	20	(determin$5 with sex with chick$5) and ((stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) with wing$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:47
S57	7	(determin$5 with sex with chick$5) and ((stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) with (open or opening or open$3) with wing$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:50
S58	72	(Karimpour near5 Ramin).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:52
S59	2	(Karimpour near5 Ramin).in. and (sex with chick$5)	US-PGPUB; USPAT; USOCR;	OR	ON	2019/10/31 10:52

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S60	6	(Karimpour near5 Ramin).in. and (stimuli with wing)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:53
S61	8	(Karimpour near5 Ramin).in. and (platform and ((image near5 capture) or camera))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:54
S71	174536	((A01K45/00 OR A01K13/003 OR A01K61/13 OR A01K29/005 OR A01K45/007 OR A61D7/00 OR A61D17/00 OR A61D19/00 OR A61D1/025 OR A61D3/00 OR A61B2503/40 OR A61B2576/00 OR A61B5/0033 OR A61B5/0077 OR A61B5/43 OR A61B5/70 OR A61B5/7282 OR	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:04

		A61B5/0036 OR A61M2250/00 OR A61M5/30 OR A61M5/427 OR B65G15/30 OR B65G2201/02 OR G06T2207/30128 OR G06T7/001 OR G16H20/17 OR G16H50/20 OR Y02A90/26 OR G16Z99/00 OR H04N2201/0081).CPC.)				
S73	12391	(382/110,100).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/02/28 07:06
S74	150463	((A01K13/003 OR A01K45/00 OR A01K61/13 OR A61B2503/40 OR A61B2576/00 OR A61B5/0033 OR A61B5/0077 OR A61B5/43 OR A61B5/70 OR A61B5/7282 OR A61D17/00 OR A61D19/00 OR A61D1/025 OR A61D3/00 OR A61D7/00 OR A61M2250/00 OR	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:09

		A61M5/30 OR A61M5/427 OR B65G15/30 OR B65G2201/02 OR G06T2207/30128 OR G06T7/001 OR G16H20/17 OR G16H50/20 OR Y02A90/26).CPC.)				
S75	186534	(S71 or S73) or (S74)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:09
S76	245	(determin$5 with sex with chick$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:10
S77	67	S75 and S76	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:10
S78	159	(determin$5 with sex with chick$5) and (stimuli or belt or	US-PGPUB; USPAT;	OR	ON	2020/02/28 07:10

		conveyor or vibrat$4 or light or strobe or air or blow$3)	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S79	45	S75 and S78	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:10
S80	59	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (camera or (image with captur$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:10
S81	22	S75 and S80	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:10
S82	20	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (camera or (image with captur$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2020/02/28 07:11

		and (database)	IBM_TDB			
S83	9	S75 and S82	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:11
S84	199	(sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (deviat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:11
S85	13	S75 and S84	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:11
S86	245	(determin$5 with sex with chick$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:12
S87	67	S75 and S86	US-PGPUB;	OR	ON	2020/02/28 07:12

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S88	59	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (camera or (image with captur$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:13
S89	22	S75 and S88	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:13
S90	20	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (camera or (image with captur$4)) and (database)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:13
S91	9	S75 and S90	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/02/28 07:13

			DERWENT; IBM_TDB			
S92	20	(determin$5 with sex with chick$5) and ((stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) with wing$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:14
S93	8	S75 and S92	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:14
S94	7	(determin$5 with sex with chick$5) and ((stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) with (open or opening or open$3) with wing$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:15
S95	3	S75 and S94	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:15
S96	6	(database with (pictures	US-	OR	ON	2020/02/28

		or photos or images) with male with female with wing$3)	PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			07:17
S97	7	((database or storage or memory or collection$3 or stor$3) with (pictures or photos or images) with male with female with wing$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:17
S98	2	(compar$5 with (pictures or photos or images) with male with female with wing$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:19
S99	18	((database or storage or memory or collection$3 or stor$3) same (pictures or photos or images) same male same female same wing$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:19
S100	18	(compar$5 same (pictures or photos or images) same male same female same wing$3)	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2020/02/28 07:20

			EPO; JPO; DERWENT; IBM_TDB			
S101	6	((database or storage or memory or collection$3 or stor$3) same (pictures or photos or images) same healthy same unhealthy same chick$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:23
S102	641	((database or storage or memory or collection$3 or stor$3) same (pictures or photos or images) same chick$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:24
S103	40	S75 and (((database or storage or memory or collection$3 or stor$3) same (pictures or photos or images) same chick$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:24
S104	25	S75 and (((database or storage or memory or collection$3 or stor$3) same (pictures or photos or images) same chick$3)) and (remov$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:25

S105	417	(((database or storage or memory or collection$3 or stor$3) same (pictures or photos or images) same chick$3)) and (remov$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:26
S106	432	(((database or storage or memory or collection$3 or stor$3) same (pictures or photos or images) same chick$3)) and (remov$5 or drop$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:27
S107	130	(((database or storage or memory or collection$3 or stor$3) same (pictures or photos or images) same chick$3)) and ((remov$5 or drop$5) same chick$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:27
S108	25	S75 and ((((database or storage or memory or collection$3 or stor$3) same (pictures or photos or images) same chick$3)) and (remov$5))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:28
S109	25	((((database or storage or memory or collection$3 or stor$3) same (pictures or	US-PGPUB; USPAT; USOCR;	OR	ON	2020/02/28 07:28

		photos or images) same chick$3)) and (remov$5 or drop$5)) and S75	FPRS; EPO; JPO; DERWENT; IBM_TDB			
S110	2	((((database or storage or memory or collection$3 or stor$3) same (pictures or photos or images) same chick$3)) and ((remov$5 or drop$5) same chick$5)) and S75	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:29
S111	1	"20100198024"	US-PGPUB	OR	ON	2020/02/28 07:30
S112	1	("6396938").PN.	USPAT	OR	OFF	2020/02/28 07:37
S113	1	("20010035370").PN.	US-PGPUB	OR	OFF	2020/02/28 07:37
S114	2	(Karimpour near5 Ramin).in. and (sex with chick$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:39
S115	6	(Karimpour near5 Ramin).in. and (stimuli with wing)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:40
S116	8	(Karimpour near5	US-	OR	ON	2020/02/28

		Ramin).in. and (platform and ((image near5 capture) or camera))	PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			07:40
S117	2	(Karimpour near5 Ramin).in. and (platform and ((image near5 capture) or camera)).CLM.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:41
S118	1	(Karimpour near5 Ramin).in. and (stimuli with wing).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:41
S119	6	(Karimpour near5 Ramin).in. and (database and male and female)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:42
S120	0	(Karimpour near5 Ramin).in. and (database and male and female).clm.	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2020/02/28 07:42

			EPO; JPO; DERWENT; IBM_TDB			
S121	7	(Karimpour near5 Ramin).in. and (database)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:42
S122	1	(Karimpour near5 Ramin).in. and (database).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:42
S123	11	(Karimpour near5 Ramin).in. and (remov$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:43
S124	2	(Karimpour near5 Ramin).in. and (remov$5).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:43

S125	1	(Karimpour near5 Ramin).in. and (remov$5 with chick$5).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:43
S126	8	(Karimpour near5 Ramin).in. and (image with chick)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:44
S127	1	(Karimpour near5 Ramin).in. and (image with chick).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/02/28 07:44

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S62	12	(Karimpour near5 Ramin).in.	US-PGPUB; USPAT	OR	ON	2019/10/31 10:54
S63	1	(Karimpour near5 Ramin).in. and (sex with chick$5)	US-PGPUB; USPAT	OR	ON	2019/10/31 10:55

S64	1	(Karimpour near5 Ramin).in. and (stimuli with wing)	US-PGPUB; USPAT	OR	ON	2019/10/31 10:55
S65	3	(Karimpour near5 Ramin).in. and (platform and ((image near5 capture) or camera))	US-PGPUB; USPAT	OR	ON	2019/10/31 10:55
S66	3	(Karimpour near5 Ramin).in. and (platform and ((image near5 capture) or camera)) and (computer or processor)	US-PGPUB; USPAT	OR	ON	2019/10/31 10:56
S67	2	(Karimpour near5 Ramin).in. and ((platform and ((image near5 capture) or camera)) and (computer or processor)).clm.	US-PGPUB; USPAT	OR	ON	2019/10/31 10:56
S68	1	(Karimpour near5 Ramin).in. and (platform and ((image near5 capture) or camera)) and (computer or processor) and (sex with chick$5)	US-PGPUB; USPAT	OR	ON	2019/10/31 10:57
S69	1	(Karimpour near5	US-	OR	ON	2019/10/31

		Ramin).in. and (platform and ((image near5 capture) or camera)) and (computer or processor) and (stimuli with wing)	PGPUB; USPAT			10:57
S128	1	(Karimpour near5 Ramin).in. and (sex with chick$5)	US-PGPUB; USPAT	OR	ON	2020/02/28 08:08
S129	1	(Karimpour near5 Ramin).in. and (stimuli with wing)	US-PGPUB; USPAT	OR	ON	2020/02/28 08:08
S130	3	(Karimpour near5 Ramin).in. and (platform and ((image near5 capture) or camera))	US-PGPUB; USPAT	OR	ON	2020/02/28 08:09
S131	2	(Karimpour near5 Ramin).in. and (platform and ((image near5 capture) or camera)).CLM.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:09
S132	1	(Karimpour near5 Ramin).in. and (stimuli with wing).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:09
S133	1	(Karimpour near5 Ramin).in. and (database and male and female)	US-PGPUB; USPAT	OR	ON	2020/02/28 08:09
S134	2	(Karimpour near5	US-	OR	ON	2020/02/28

		Ramin).in. and (database)	PGPUB; USPAT			08:10
S135	1	(Karimpour near5 Ramin).in. and (database).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:10
S136	11	(Karimpour near5 Ramin).in. and (remov$5)	US-PGPUB; USPAT	OR	ON	2020/02/28 08:10
S137	2	(Karimpour near5 Ramin).in. and (remov$5).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:10
S138	1	(Karimpour near5 Ramin).in. and (remov$5 with chick$5).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:10
S139	3	(Karimpour near5 Ramin).in. and (image with chick)	US-PGPUB; USPAT	OR	ON	2020/02/28 08:10
S140	1	(Karimpour near5 Ramin).in. and (image with chick).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:11
S141	1	(sex and chick and platform).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:13
S142	12	(sex and chick).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:14
S143	4	(sex and chick and wing$3).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:14
S144	1	(sex and chick and wing$3 and compar$5).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:14

S145	154	(health and chick$5).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:15
S146	2	(health and chick$5 and platform).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:15
S147	29	(health and chick$5 and compar$5).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:16
S148	1	(health and chick$5 and (compar$5 with image$3)).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:16
S149	110	(sort$5 and chick$5).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:16
S150	23	(sort$5 and chick$5 and (remov$5 or drop$5)).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:17
S151	2	(sort$5 and (chick$5 with (remov$5 or drop$5))).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:17
S152	1	(sort$5 and (chick$5 with (remov$5 or drop$5)) and deviat$5).clm.	US-PGPUB; USPAT	OR	ON	2020/02/28 08:18

3/2/2020 9:08:27 AM
C:\Users\dpopovici\Documents\EAST\Workspaces\15775706_02_28_2020.wsp

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	15/775,706
Filing Date	5/11/2018
First Named Inventor	Karimpour, Ramin
Art Unit	2677
Examiner Name	D. Popovici
Attorney Docket Number	673-06-UTIL

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
/D.P/		US- US 2010/0198024	08-05-2010	Elazari-Volcani et al.	Para. 0135;
		US-			
		US-			
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		US-			
		US-			

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]

Examiner Signature	/DOV POPOVICI/	Date Considered	02/28/2020

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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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.
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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.
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BIB DATA SHEET

CONFIRMATION NO. 3566

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
15/775,706	05/11/2018	382	2677	374-2

APPLICANTS
Applied LifeSciences and Systems, LLC, Raleigh, NEW CALEDONIA

INVENTORS
Ramin Karimpour, Raleigh, NC;

** **CONTINUING DATA** ********** Yes /D.P./
This application is a 371 of PCT/US2016/061536 11/11/2017
which claims benefit of 62/349,981 06/14/2016
and claims benefit of 62/254,737 11/13/2015

** **FOREIGN APPLICATIONS** ********** None /D.P./

** **IF REQUIRED, FOREIGN FILING LICENSE GRANTED** ** SMALL ENTITY **
08/30/2018

Foreign Priority claimed ❑ Yes ☑ No 35 USC 119(a-d) conditions met ❑ Yes ☑ No Verified and Acknowledged /DOV POPOVICI/ Examiner's Signature	❑ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		NC	7	21	3

ADDRESS

Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518
UNITED STATES

TITLE

System and Method of Determining the Health and Gender of a Chick

FILING FEE RECEIVED		
650	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	❑ All Fees ❑ 1.16 Fees (Filing) ❑ 1.17 Fees (Processing Ext. of time) ❑ 1.18 Fees (Issue) ❑ Other _____ ❑ Credit

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Sheet 1 of 1

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First Named Inventor	Karimpour, Ramin
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Examiner Name	D. Popovici
Attorney Docket Number	673-06-UTIL

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US- US 2010/0198024	08-05-2010	Elazari-Volcani et al.	Para. 0135;
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]

Examiner Signature		Date Considered	

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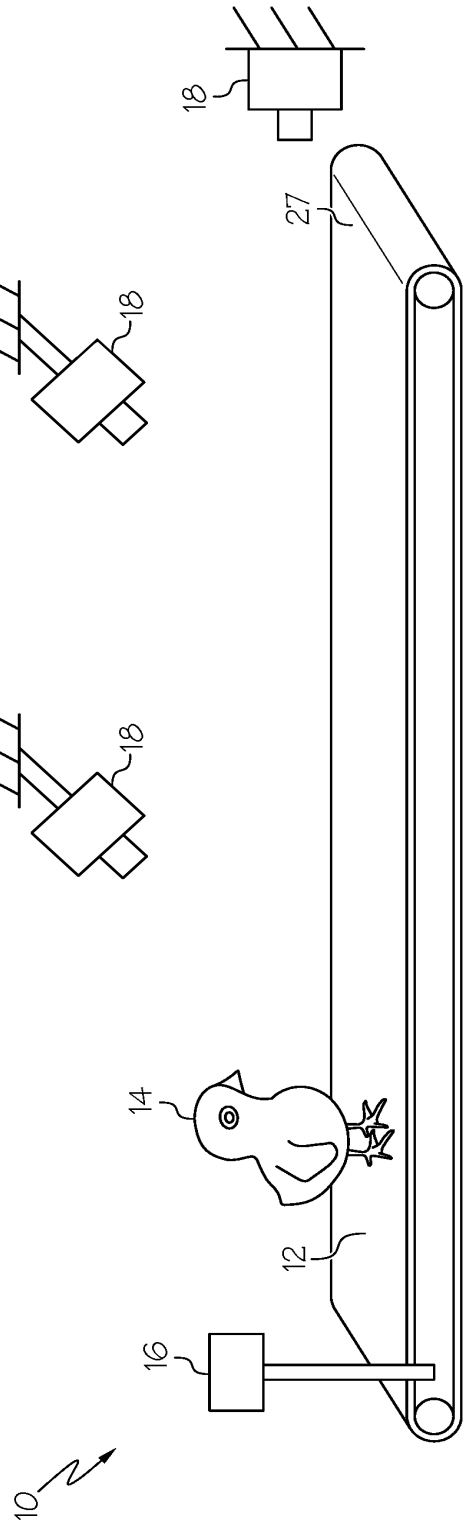


FIG. 1

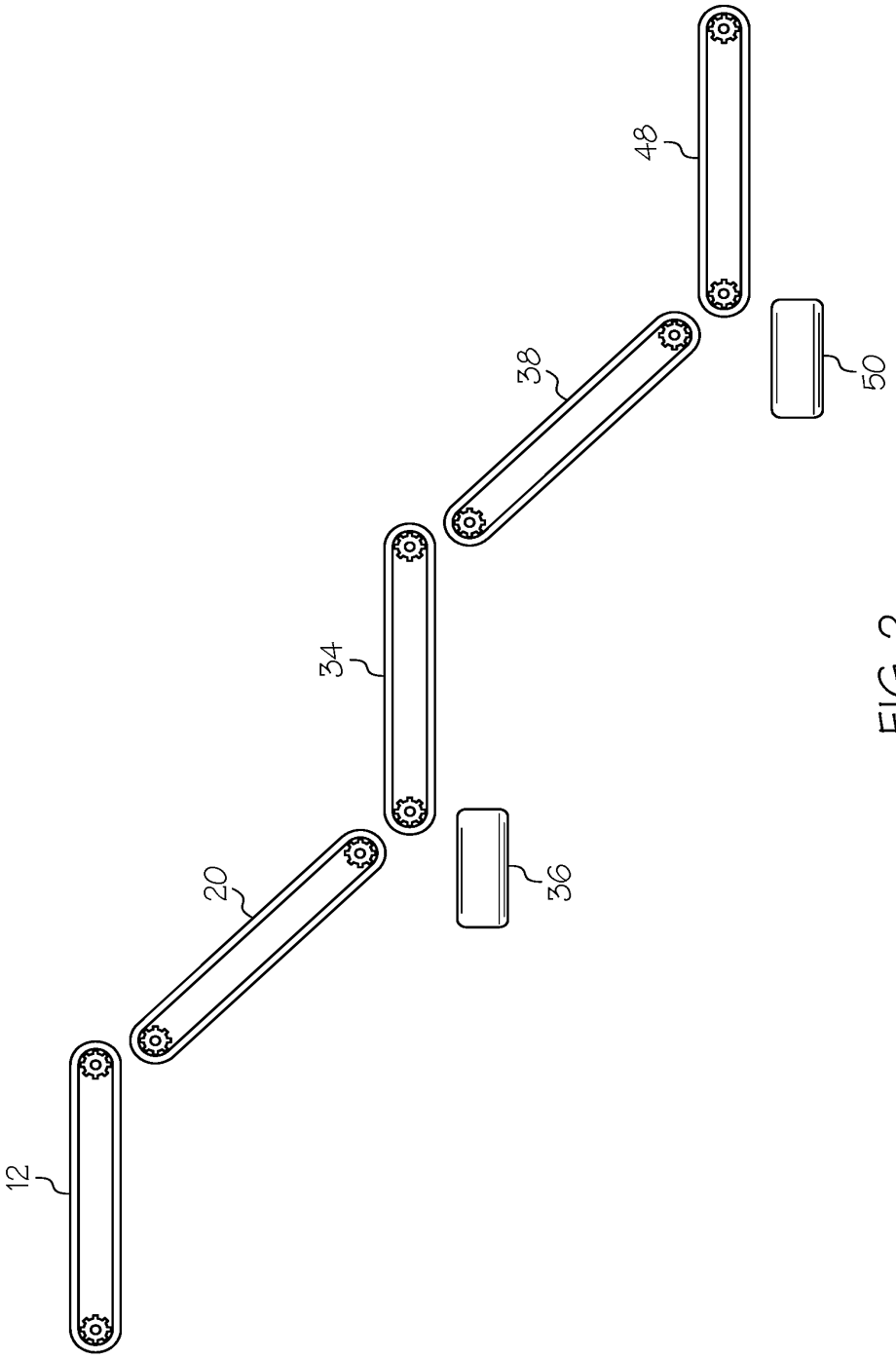


FIG. 2

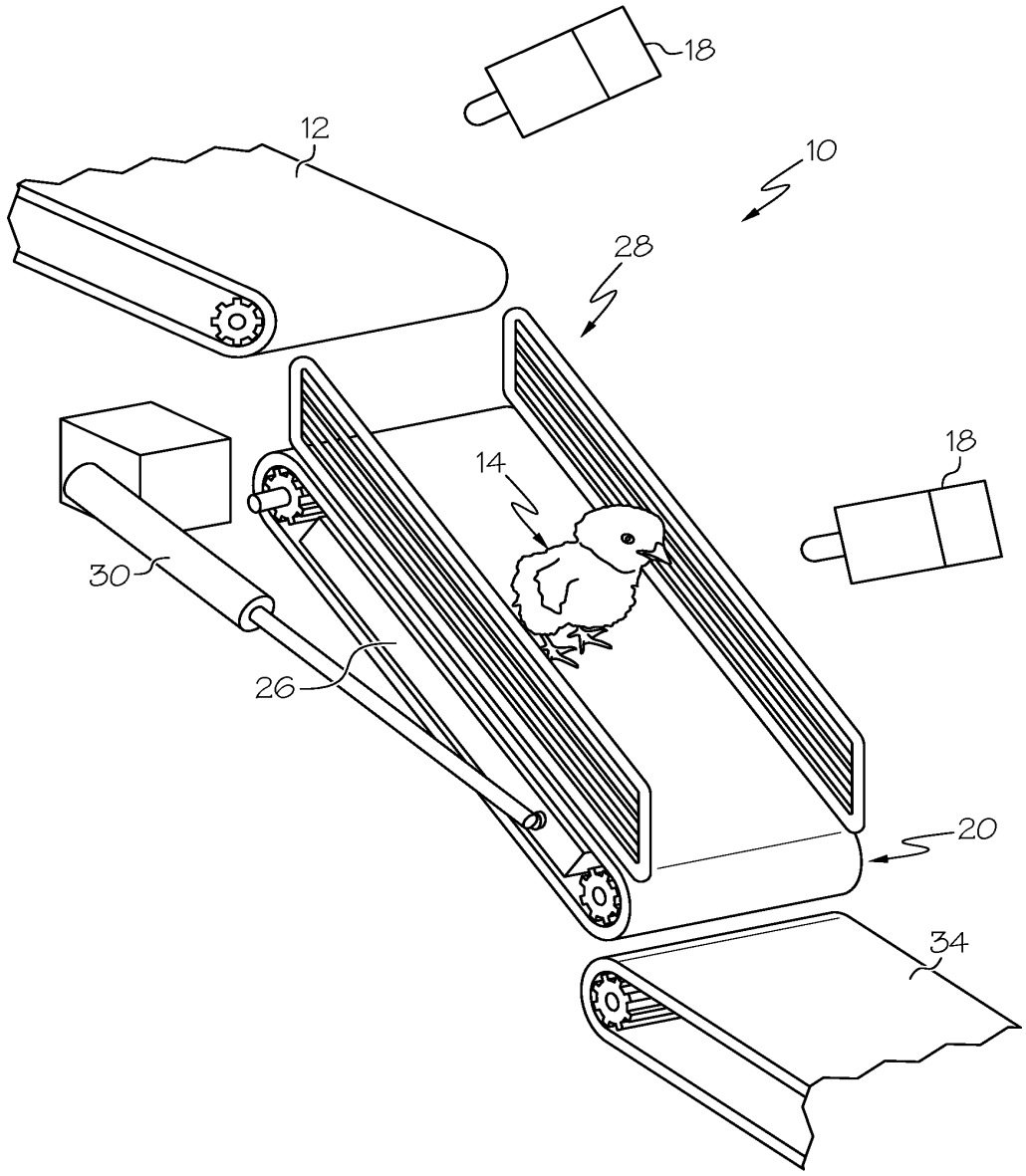


FIG. 3

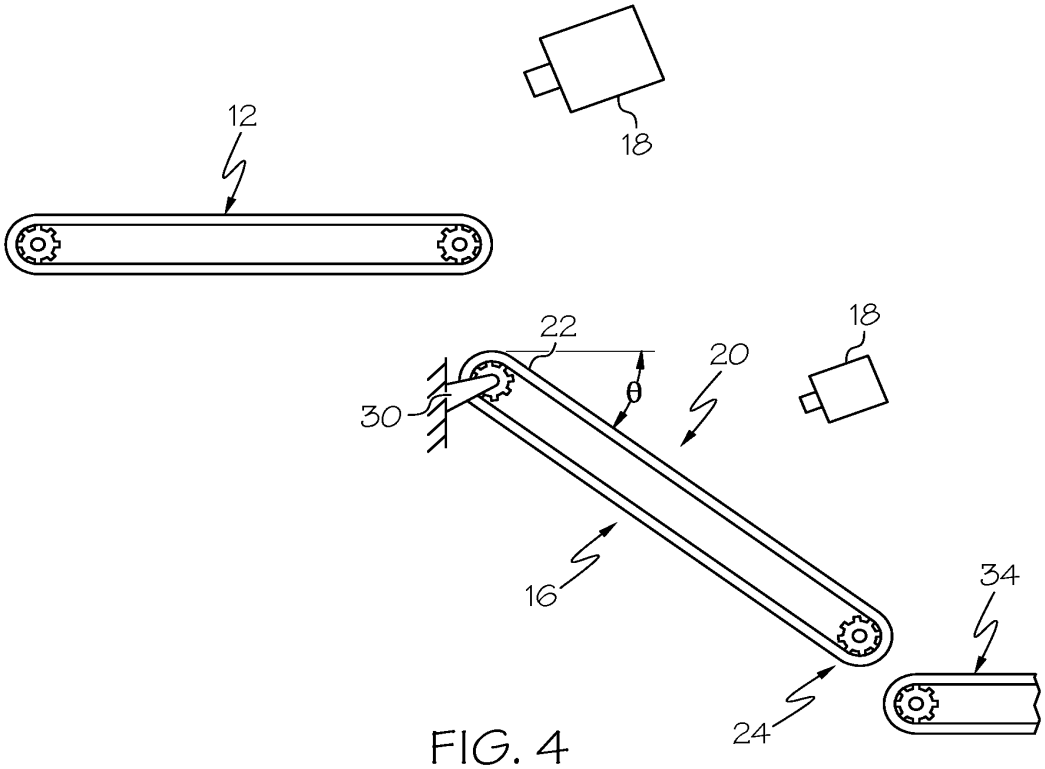


FIG. 4

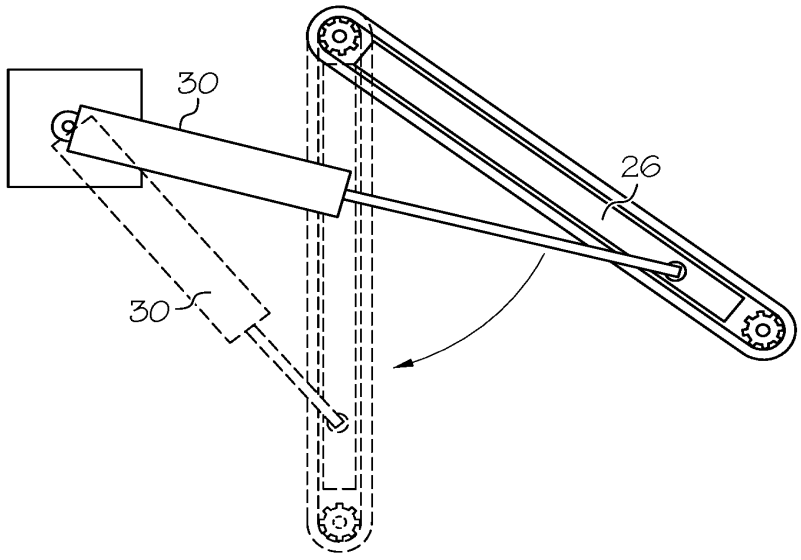


FIG. 5

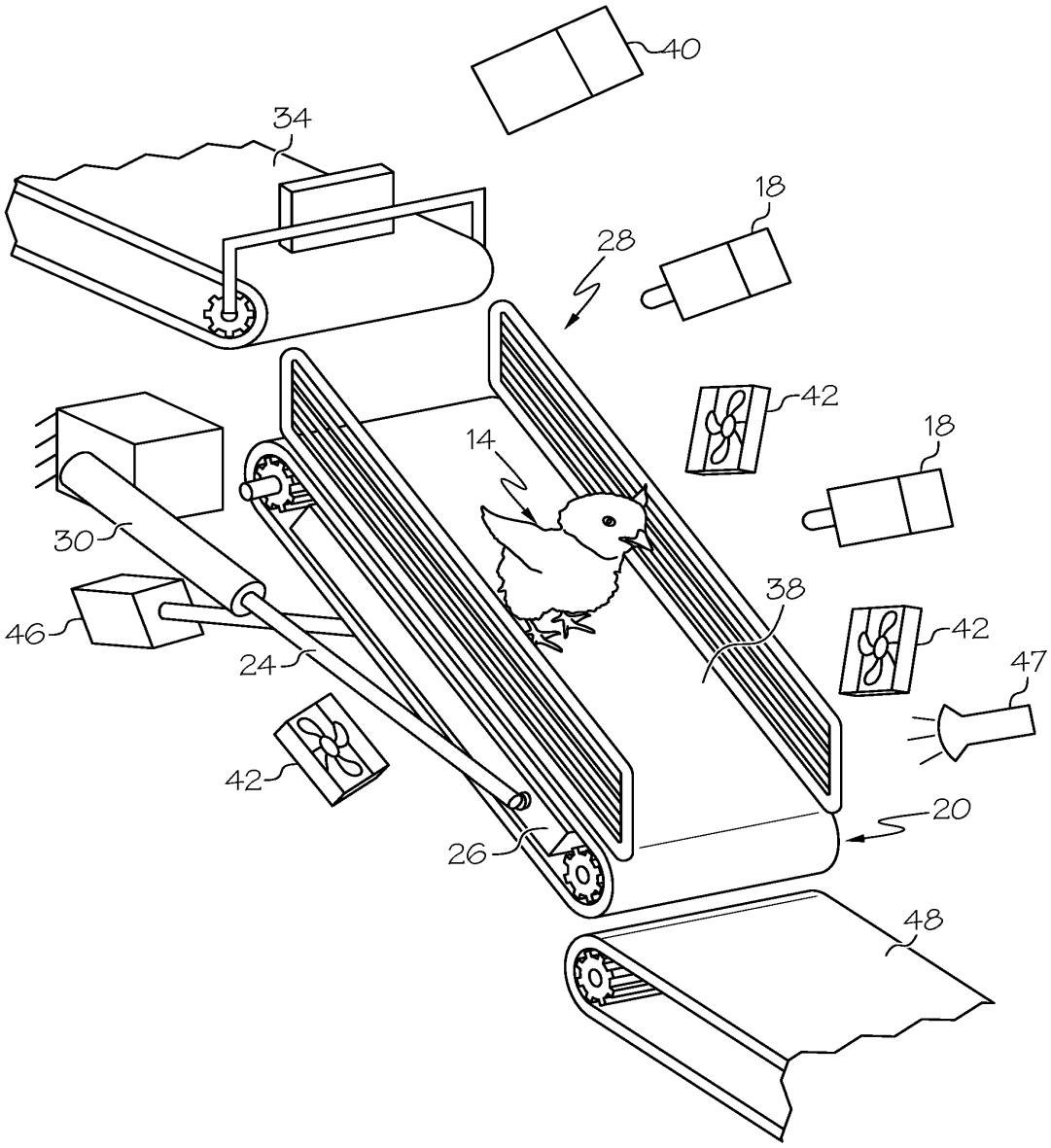


FIG. 6

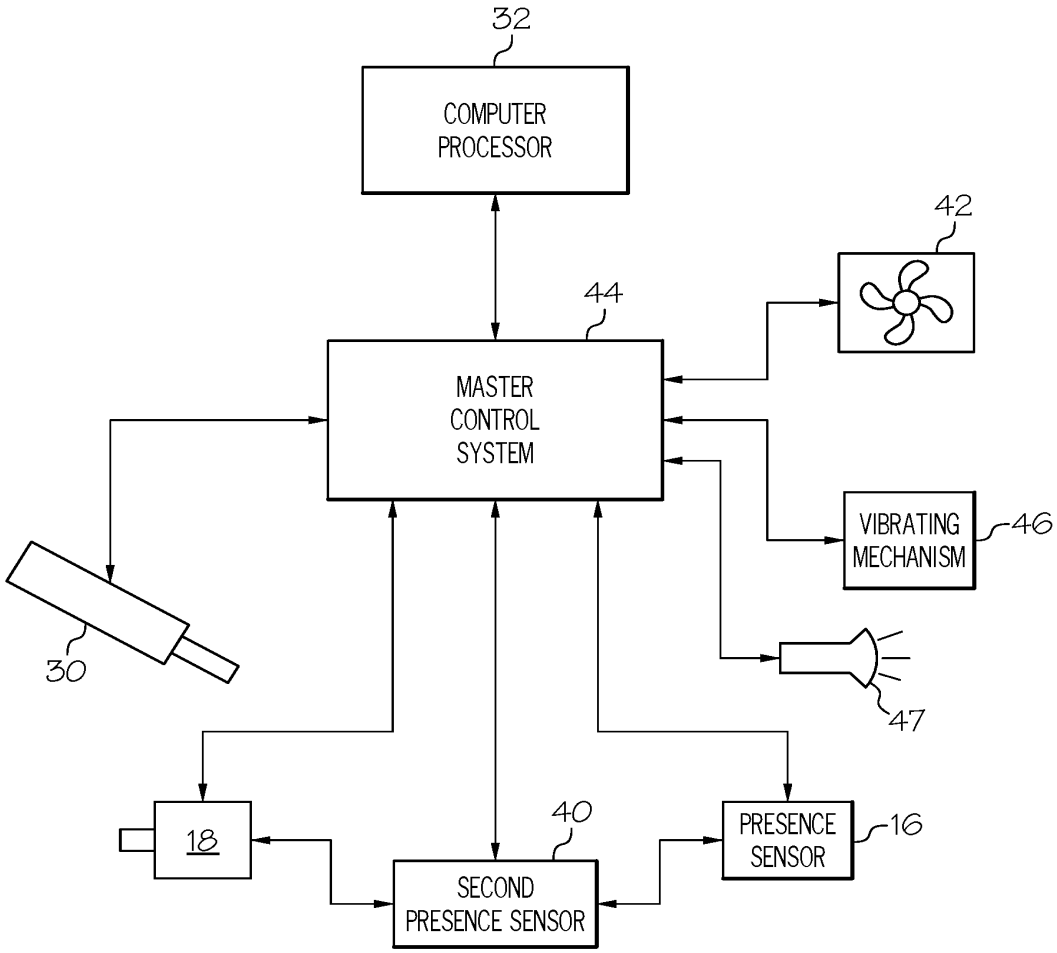

32
COMPUTER PROCESSOR
42
44
MASTER CONTROL SYSTEM
VIBRATING MECHANISM
46
30
47
18
40
PRESENCE SENSOR
16
SECOND PRESENCE SENSOR

FIG. 7

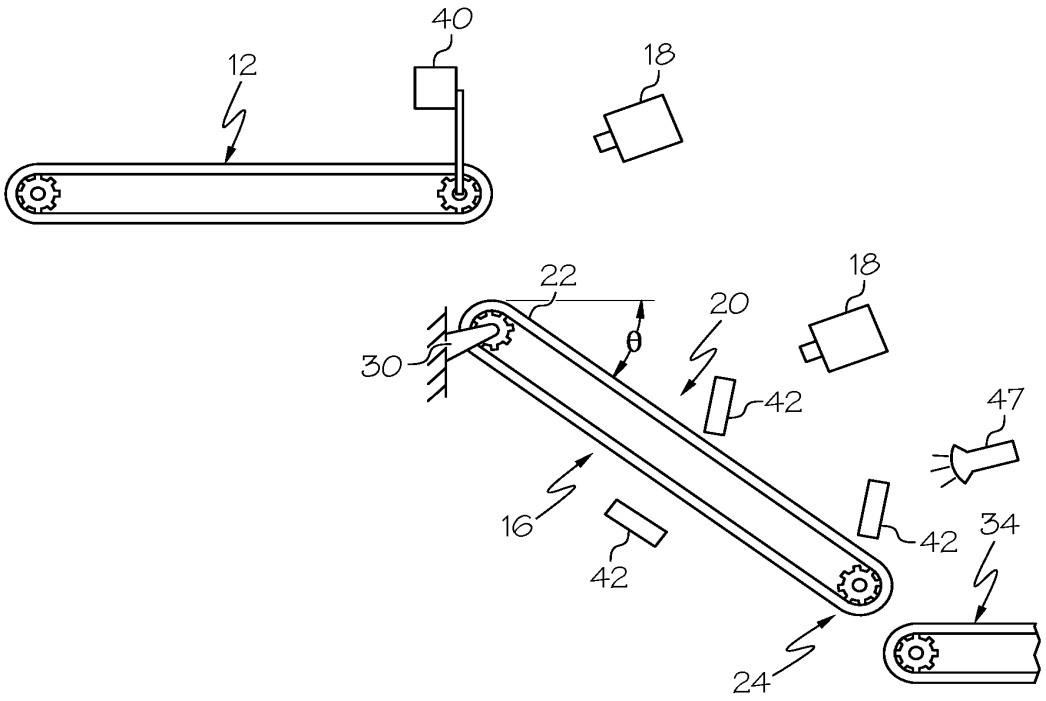


FIG. 8

Electronic Acknowledgement Receipt	
EFS ID:	38498094
Application Number:	15775706
International Application Number:	
Confirmation Number:	3566
Title of Invention:	System and Method of Determining the Health and Gender of a Chick
First Named Inventor/Applicant Name:	Ramin Karimpour
Customer Number:	90741
Filer:	Kathleen M. Lynch
Filer Authorized By:	
Attorney Docket Number:	374-2
Receipt Date:	05-FEB-2020
Filing Date:	11-MAY-2018
Time Stamp:	12:10:19
Application Type:	U.S. National Stage under 35 USC 371

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		673-06-UTIL_2020-02-05_Amendment.pdf	197108 08216454c691f55e09be848a51f4f50f27975fa5	yes	19

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	1
	Claims	2	6
	Applicant Arguments/Remarks Made in an Amendment	7	19

Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	sb0008a.pdf	238116 0ae495531f89ffa5057bdae9957b3bb70f104b11	no	2
Warnings:					
Information:					
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3	Drawings-only black and white line drawings	ReplacementDwgs.pdf	80748 665fa7ad3bc6633c1ae89f34b4ef476fbf00698c	no	7
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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Ramin Karimpour
Serial No.:	15/775,706
Title:	System and Method for Determining the Health and Gender of a Chick
Examiner:	D. Popovici
Group Art Unit	2677

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

AMENDMENT

Dear Sir:

This is in response to the Office Action having a notification date of November 5, 2019.

Amendments to the Drawings are reflected in a request to amend the drawings and description of the amendments which begins on page 6 of this paper. Amendments to the Claims are reflected in a listing of claims showing all deletions and addition, which begins on page 2 of this paper.

Remarks begin on page 6 of this paper.

LISTING OF CLAIMS

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

1. (Currently amended) A system for determining the sex of a chick comprising:
a moving platform to support an unrestrained chick of a particular breed;
at least one stimuli to cause the chick to open its wings;
an image capture device to capture at least one image of the chick;
~~a database having a library of digital images;~~ and
a computer processor having a database of images of male and female wing patterns for the particular breed, the computer processor in communication with the image capture device ~~and the database~~, whereby the image capture device captures at least one image of the chick and transmits it to the computer processor where the image is processed and compared to the database to determine the sex ~~the computer processor calculates a level of deviation of the image~~.

2. (Currently amended) The system of claim 1further comprising a master control system in communication with the image capture device ~~camera~~, moving platform, ~~database~~, and computer processor ~~and moving platform~~.

3. (Previously presented) The system of claim 1 wherein the stimulus may be one or more of the following group: ~~is~~ an angled conveyor, a vibrating conveyor, a strobe light, or a stream of air blowing on the chick.

4 - 8 Cancelled

9. (Currently amended) A system for determining the health of a day old chick comprising:
a moving platform upon which an unrestrained chick is supported ~~positioned~~;
image capturing device to capture at least one electronic image of the chick ~~on the moving platform~~;
~~a database containing electronic images of healthy and unhealthy chicks within the chick's breed~~;

computerized image processor in communication with the image capture device, the computerized processor having access to a database of images of healthy and unhealthy chicks of the same breed, whereby the image capture device captures at least one image of the chick, and it is transmitted to the computerized image processor where the computerized image processor compares the at least one image of the chick to the database of images to detect ~~determines the level of~~ a deviation from the database of images ~~of the image of the chick~~.

10. (Previously presented) The system of claim 9 wherein the image is that of the feet, face, abdomen, wing or legs.

11-13 Cancelled

14. (Previously presented) The system of claim 32 wherein the removal device comprises a moving platform position altering device.

15-20 Cancelled

21. (Currently amended) A system of sorting chicks on the basis of a predetermined feature of a chick comprising:
a moving platform to support an unrestrained chick;

an image capture device positioned proximate to the moving platform to capture at least one image of the chick as it passes on the moving platform;
a computer processor in communication with the image capture device, the computer processor having a database of images of a predetermined feature of a chick therein, the computer processor capable of processing images and determining deviation from the database of images ~~a predetermined value~~; and
removing means for removing a chick from the moving platform, the removing means in communication with the computer processor, whereby when the image capture device takes an image of the chick and transmits it to the computer processor, the computer processor processes the image and determines ~~the level of~~ any deviation of the image from the database of images ~~chick's predetermined feature~~, if ~~the level of~~ a deviation is detected ~~exceeds a predetermined value~~, the computer processor communicates with the removing means to remove the chick from the moving platform.

22-23 Cancelled.

24. (Previously presented) The system of claim 21 wherein the predetermined feature is the wing, face, abdomen, or the foot.

25. (Currently amended) The system of claim 21 ~~22~~ wherein the ~~library~~ database of digital images is limited to those of the chick's breed.

26. (Original) The system of claim 21 further comprising a removing device in communication with the computer processor and activated when the computer processor determines the level of deviation of a chick exceeds a predetermined range, the removing device removes a chick having a variance exceeding the predetermined range from the moving platform.

27. (Original) The system of claim 21 further comprising at least one stimuli proximate to the moving platform.

28. (Currently amended) The system of claim 27 ~~26~~ wherein the stimulus may be one or more of the following group: an angled conveyor ~~belt~~, a vibrating conveyor ~~belt~~, a strobe light or a stream of air blowing on the chick.

29. (Currently amended) The system of claim 28 ~~9~~ wherein the angled conveyor has a near end and a far end and the far end is lower than the near end ~~further comprising a database having a library of digital images, the database in communication with the computer processor~~.

30. (Currently amended) The system of claim 29 wherein the angled conveyor is oriented at an angle ɵ to the horizon ~~level of deviation is determined by comparing the image captured by the image capture device to the library of digital images~~.

31. (Currently amended) The system of claim 30 ~~7~~ wherein angle ɵ is between 0 and 90 ~~the database has images particular to the chick's breed~~.

32. (Currently amended) The system of claim 1 further comprising a removing device in communication with the computer processor, whereby when the computer determines the chick's sex ~~calculated level of deviation exceeds a predetermined range~~, the removing device is activated and removes a chick having a sex determination different from ~~variance exceeding~~ the predetermined sex remaining on ~~range~~ ~~from~~ the moving platform.

33. (Currently amended) The system of claim 9 further comprising a removing device in communication with the computerized image processor, whereby when ~~the calculated level of~~ a deviation is detected ~~exceeds a predetermined range~~, the removing device is

activated and removes a chick having a detected deviation ~~variance exceeding the predetermined range~~ from the moving platform.

34. (Original) The system of claim 26 wherein the removing device comprises a moving platform position altering device.

REMARKS

Claims 1-3, 7-10 and 21-34 are presently pending in this application. Applicant has cancelled claims 7-8, 11-13, 15-20, and 22-23. In view of the foregoing amendments and following remarks, applicant submits that all claims are now in condition for allowance.

Information Disclosure Statement

The Examiner notes that the Information Disclosure Statement submitted by the Applicant has been considered except for US 2010/0019802. The Examiner notes that the publication date and inventor name were incorrect. The publication number should have been US 2010/0198024 A1 published on August 5, 2010 and naming Elazari-Volcani et al. as inventors. Applicant submits herewith a Supplemental Information Disclosure Statement for the Examiner's consideration correcting the above-mentioned errors for the referenced prior art.

Drawing Objection

The drawings have been objected to by the Examiner. The Examiner states that there are empty blocks 46, 16 and 40 in Figure 7. Applicant has amended Figure 7 to include labels on items 46, 16 and 40. Applicant submits that amended Figure 7 in substitute sheet 6 and thus should no longer raise any objection by the Examiner.

Claim Rejections Based on 35 U.S.C. §112(a)- Written Description Requirement

The Examiner has rejected claims 1-3, 7-10 and 21-34 on the basis of 35 U.S.C. §112(a) for failing to comply with the written description requirement. The Examiner states that the claims contain subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the invention was made, had possession of the claimed invention. The Examiner states that claim 1, line 9 recites a computer process that "calculates a level of deviation of the

image." The Examiner submits that the phrase is not described in the specification and fails to comply with the written description requirement.

Applicant has amended claim 1 to delete the above-referenced language and to include language that complies with Section 112(a). Claims 2-3 depend from amended claim 1 and thus are also now in compliance with Section 112(a). Claims 7-8 have been cancelled and thus rejection of those claims is now moot.

Claim 9 has been amended to read as follows:

9. A system for determining the health of a day old chick comprising:

a moving platform upon which a chick is supported;

image capturing device to capture at least one electronic image of the chick;

computerized image processor in communication with the image capture device, the computerized processor having access to a database of images of healthy and unhealthy chicks of the same breed, whereby the image capture device captures at least one image of the chick, and it is transmitted to the computerized image processor where the computerized image processor compares the at least one image of the chick to the database of images to detect ~~determines the level of~~ any deviation from the database of images ~~of the image of the chick~~.

Applicant notes that page 8, lines 1-7 read as follows:

The image or images are electronically communicated to the computer processor 32 (Fig.7). The computer processor 32 processes the images and compares them with those images in its database of healthy and unhealthy chicks of the same breed. In comparing the camera images with the digital image library, the computer processor 32 is able to detect any abnormalities or deviations in the images taken from standard images in the database. If there is a deviation detected in the image taken, the computer processor 32 registers such a deviation as an abnormality or affliction that needs closer attention.

Applicant notes that the specification supports the use of the amended claim language provided above. Page 8, lines 4-6 states that the computer processor is "able to detect any abnormalities or deviations in the images taken from the standard images in the

database." This language clearly supports that amended language of claim 9 and is thus in compliance with 35 U.S.C. §112(a). Claims 10, 29-30 and 33 are dependent from claim 9 and is also in compliance with Section 112(a).

Claim 21 has been rejected under 35 U.S.C. §112(a). Applicant has amended claim 21 to read as follows:

> 21. (Currently amended) A system of sorting chicks on the basis of a predetermined feature of a chick comprising:
>
> a moving platform to support a chick;
>
> an image capture device positioned proximate to the moving platform to capture at least one image of the chick as it passes on the moving platform;
>
> a computer processor in communication with the image capture device, the computer processor having a database of images therein, the computer processor capable of processing images and determining deviation from the database of images ~~a predetermined value~~; and
>
> removing means for removing a chick from the moving platform, the removing means in communication with the computer processor, whereby when the image capture device takes an image of the chick and transmits it to the computer processor, the computer processor processes the image and determines ~~the level of~~ any deviation of the image from the database of images ~~chick's predetermined feature~~, if ~~the level of~~ a deviation is detected ~~exceeds a predetermined value~~, the computer processor communicates with the removing means to remove the chick from the moving platform.

Applicant submits that the amendments made to claim 21 have support in the specification. Page 7 line 11 describes the computer processor as having a library of digital images. Furthermore, page 8, lines 1-7 describe the computer processor as being able to compare the captured image with those in the database of images. In addition, the computer processor is described as being able to "detect any abnormalities or deviations in the images take from the standard images in the database." Thus, the language of

amended claim 21 has support in the specification and is in compliance with Section 112(a).

Claims 22-28 and 34 are dependent on claim 21. Since claim 21 has been amended, claims 22-28 and 34 should now be in compliance with Section 112(a).

Claim Rejections Based on 35 U.S.C. §112(a)- Enablement Requirement

Claims 1-3, 7-10, and 21-34 are rejected under 35 U.S.C. §112(a) for failing to comply with the enablement requirement. The Examiner contends that the claims contain subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains to make or use the invention. Applicant disagrees.

As amended, claims 1-3, 7-10 and 21-34 comply with the enablement requirement. As discussed above, amended claim 1 includes language included in the specification. Accordingly claim 1 fulfills the enablement requirement of Section 112(a). Claims 2-3 depend from amended claim 1 and also fulfill the enablement requirement.

Claims 7-8 have been cancelled. Claim 9 has been amended to incorporate language provided in the specification as discussed in detail above. Thus, Applicant submits, claim 9 complies with the enablement requirement of Section 112(a). Claims 10, 29-30 and 33 depend from amended claim 9. It follows that they are also in compliance with the enablement requirement and are now in condition for allowance.

Claim 21 has also been amended to include language found in the specification. As described in more detail above, claim 21 incorporates language found in the specification with sufficient specificity to enable one of ordinary skill in this art to make and use the invention. Thus, claim 21 meets the enablement requirement of Section 112(a) and should be allowed. Claims 22-28 and 34 depend from amended claim 21. It follows that they also meet the requirements of Section 112(a) and should be allowed.

Claim Rejections Based on 35 U.S.C. §112(b)

The Examiner has rejected claims 1-3, 7-10 and 21-34 as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention under

Section 112(b). With regard to amended claim 1, the Examiner's rejections have been addressed in Applicant's amendments to claim 1. As such, Applicant believes claim 1 is now in condition for allowance. With regard to claim 2, Applicant has amended claim 2 to delete "the camera" and add "the image capture device." Such amendment provides proper antecedent basis for "the image capture device" and overcomes the rejection based on Section 112(b).

The Examiner has rejected claim 33 as being indefinite under Section 112(b). In particular, the Examiner submits that the term "the calculated level of deviation" in claim 33 lacks antecedent basis. Applicant has amended claim 33 and submits that claim 33 now includes appropriate antecedent basis. As such, Applicant submits claim 33 is now in condition for allowance.

Claim 9 has been rejected under 35 U.S.C. §112(b). The Examiner contends that the phrase "the computerized image processor determines the level of deviation" as being vague, unclear and indefinite in the context of the claim. Applicant has amended claim 9 and submits that claim 9 is now in compliance with Section 112(b) and should be allowed. Claims 10, 29-30 and 33 depend from amended claim 9. As such, Applicant submits that these claims are also in compliance with Section 112(b) and should be allowed.

Claim 21 has been rejected as being indefinite under Section 112(b). The Examiner states that lines 6-7, and 10-13, recite "the computer processor capable of processing images and determining deviation from a predetermined value" and "the computer processor processes the image and determines the level of deviation of the chick's predetermined feature, if the level of deviation exceeds a predetermined value, the computer processor communicates with the removing means to remove the chick from the moving platform" is unclear, vague and indefinite in the context of the claim. Applicant has amended claim 21 and Applicant contends that amended claim 21 is no longer unclear, vague or indefinite. Thus, amended claim 21 is in compliance with Section 112(b) and should be allowed. Claims 22-28 and 34 depend from claim 21. Because amended claim 21 is in compliance with Section 112(b), it necessarily follows that dependent claims 22-28 and 34 also comply with Section 112(b) and should be allowed.

Claim Rejections Based on 35 U.S.C. §103

Claims 1, 2, 3 and 32 are rejected by the Examiner on the basis of 35 U.S.C. §103 as being unpatentable over Tao et al. (U.S. Patent No. 6,396,938) in view of Yavnai et al. (US2001/0035370 A1). The Examiner states that Tao et al. discloses a system for determining the sex of a chick. The Examiner contends that the Tao et al. system includes a moving platform (13), an image capture device (15), a computer processor (21) in communication with the image capture device (15), whereby the image capture device (15) captures at least one image of the chick and transmits it to the computer processor (21) where the image is processed and the computer processor (21) calculates a level of deviation of the image. The Examiner admits that Tao et al. does not teach or disclose at least one UV (17) as a stimuli to cause the chick to open its wings.

The Examiner states that Yavnai et al. teaches a method of automatic sexing of chicks, applying appropriate image processing to the photograph (see title and abstract), having at least one stimuli (e.g., see par 36, and 38, i.e., light source 44 shines light 46 on chick 10 whose wings are spread, par 42, vibrator 58, see par 36, vibrating) to cause the chick to open its wings. The Examiner concludes that it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have modified Tao et al. wherein the at least one UV (17) is a stimuli to cause the chick to open its wings. Applicant respectfully disagrees.

The legal concept of *prima facie* obviousness is a procedural tool of examination which applies broadly to all arts. It allocates who has the burden of going forward with production of evidence in each step of the examination process. See *In re Rinehart,* 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *In re Lintner,* 458 F.2d 1013, 173 USPQ 560 (CCPA 1972); *In re Saunders,* 444 F.2d 599, 170 USPQ 213 (CCPA 1971); *In re Tiffin,* 443 F.2d 394, 170 USPQ 88 (CCPA 1971), *amended,*448 F.2d 791, 171 USPQ 294 (CCPA 1971); *In re Warner,* 379 F.2d 1011, 154 USPQ 173 (CCPA 1967), *cert. denied,* 389 U.S. 1057 (1968). The Examiner bears the initial burden of factually supporting any *prima*

facie conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit secondary evidence to show nonobviousness. ... The initial evaluation of *prima facie* obviousness thus relieves both the examiner and applicant from evaluating evidence beyond the prior art and the evidence in the specification as filed until the art has been shown to render obvious the claimed invention. (Emphasis added).

MPEP §2142.

Applicant submits that the Examiner has not met the required burden of prima facie obviousness in this case. In order to succeed in showing prima facie obviousness, the "Examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. In view of all factual information, the Examiner must then make a determination whether the claimed invention 'as a whole' would have been obvious at that time to that person. Knowledge of applicant's disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the 'differences,' conduct the search and evaluate the "subject matter as a whole". MPEP §2142. The Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn,* 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006); see also *KSR,* 550 U.S. at 418, 82 USPQ2d at 1396 (quoting Federal Circuit statement with approval).

Obviousness may be defeated if the prior art indicates that the invention would not have worked for its intended purpose or otherwise teaches away from the invention. DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc., 567 F.3d 1314, 1326 (Fed. Cir. 2009). A reference teaches away "when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken" in the claim. Galderma Labs., L.P. v. Tolmar, Inc., 737 F.3d 731, 738 (Fed. Cir. 2013). Tao et al. discloses a system for sexing a day old chick having a conveyor (13) and having a chick retainer (14) thereon.

Chick orientation unit 39 positions the chick (9) on the chick retainer unit (14) in order to take an image. Thus, the Tao system is only successful when the chick is restrained on the chick retainer unit. Because Tao et al. teaches that in order to obtain a proper image of a chick's wing pattern, the chick must be restrained, Tao et al. teaches away from claim 1 of the present invention. Because Tao et al. teaches away from amended claim 1 it does not render claim 1 obvious.

In addition, Yavnai et al. teaches restraining a chick through the use of poles 64 or cups 40 to restrain the chick in order to cause the chick to open its wings. Amended claim 1 is directed to a system having a moving platform to support an unrestrained chick. A person of skill in this art would be discouraged from pursuing a system that allows a chick to be moved unrestrained through the system on the basis of the teachings of Tao et al. and Yavnai et al. Accordingly, claim 1 is not rendered obvious by Tao in view of Yavnai et al. and should be allowed. Claims 2, 3 and 32 depend from amended claim 1. As such, they are not rendered obvious by Tao et al. in view of Yavnai et al. and should be allowed in their present form.

Claims 7-8 and 31 are rejected under 35 U.S.C. §103 as being unpatentable over Tao et al. in view of Yavnai et al. and and further in view of Yakov Gershman, Non Patent Literature Document, cited by applicant submitted IDS filed on 10/18/2018, entitled "A simple way to determine the sex of one day poultry chickens (basic principles)". Applicant disagrees.

Claims 7 and 8 have been cancelled and thus their rejection is now moot. Claim 31 is dependent from claim 1. For the same reasons enumerated in detail above, amended claim 1 is not rendered obvious by Tao et al. in view of Yavani et al. In addition, amended claim 1 is not rendered obvious in further view of Gershman. Gersham discloses the use of a database of digital images. However, the combination of Tao et al., Yavani et al. and Gersham does not result in amended claim 1 or in dependent claim 31. It necessarily follows that dependent claim 31 should be allowed in its present form.

Claim Rejections Based on 35 U.S.C. §102(a)(1)

The Examiner has rejected claims 9-10, 21, 24, 26 and 33-34 under 35 U.S.C. 102(a)(1) as being anticipated by Tao et al. The Examiner states that as to claim 9, Tao et al. discloses a system for determining the health of a day old chick comprising: a moving platform (13) upon which a chick is supported positioned; image capturing device (15) to capture at least one electronic image of a predetermined area of the chick; computerized image processor (21) in communication with the image capture device (15), whereby the image capture device (15) captures at least one image of the chick, and it is transmitted to the computerized image processor (21) where the computerized image processor (21) determines the level of deviation of the image of the chick (see col. 5, line 36 to col. 6, line 34). Applicant respectfully disagrees.

As amended, claim 9 is directed to a system for determining the health of a day old chick having a moving platform, an image capture device and a computerized image processor. The computerized image processor has access to a database of images of healthy and unhealthy chicks. Tao does not disclose, teach or suggest the use of a database of images for use in connection with the computerized image processor. Accordingly, amended claim 9 is not anticipated by Tao et al. and should be allowed in its present form.

Claims 10 and 33 depend from claim 9. For the same reasons set forth above, claims 10 and 33 are not anticipated by Tao et al. and should be allowed.

With regard to Claim 21, the Examiner states that Tao et al. discloses a system of sorting chicks on the basis of a predetermined feature of a chick comprising: a moving platform to support a chick (13); an image capture device (15) positioned proximate to the moving platform (13) to capture at least one image of the chick as it passes on the moving platform (13); a computer processor (21) in communication with the image capture device (15), the computer processor (21) capable of processing images and determining deviation from a predetermined value; and removing means (27, 33, 31,29) for removing a chick from the moving platform (13), the removing means in communication with the computer processor (21), whereby when the image capture device (15) takes an image of the chick

and transmits it to the computer processor (21), the computer processor (21) processes the image and determines the level of deviation of the chick's predetermined feature, if the level of deviation exceeds a predetermined value, the computer processor (21) communicates with the removing means (27, 33, 31,29) to remove the chick from the moving platform (13). Applicant disagrees.

Amended claim 21 includes a database of images. Tao et al. does not disclose or describe, the use of a database of images. For the same reasons set forth above with respect to claim 7, amended claim 21 is not anticipated by Tao et al. Accordingly, rejection of claim 21 on the basis of anticipation by Tao et al. should be withdrawn and claim 21 should be allowed in its present form.

Claims 24 and 26 depend from claim 21 and claim 34 depends from claim 26. For the reasons set forth above, claims 24, 26 and 34 are not anticipated by Tao et al. Rejection of claims 24, 26 and 34 on this basis should be withdrawn and these claims should be allowed.

Claim Rejections Based on 35 U.S.C. §103

The Examiner has rejected claims 27 and 28 under 35 U.S.C. §103 as being unpatenable over Tao et al. in view of Yavnai et al. The Examiner states that as to claim 27, Tao et al. discloses at least one UV (17) (see figure 1) proximate to the moving platform (13). The Examiner states that Tao et al. does not specifically specify that the at least one UV 17 is a stimuli. The Examiner contends that Yavnai et al. teaches a method of automatic sexing of chicks, applying appropriate image processing to the photograph (see title and abstract), having at least one stimuli (e.g., see par 36, and 38, i.e., light source 44 shines light 46 on chick 10 whose wings are spread, par 42, vibrator 58, see par 36, vibrating) to cause the chick to open its wings. The Examiner concludes that it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have modified Tao et al. wherein the at least one UV (17) is a stimuli. Applicant disagrees.

Claim 27 is dependent on claim 21. For the same reasons set forth above with regard to the non-obviousness of claims 21 and 26, claim 27 is not rendered obvious by Tao et al. and Yavnai et al. As such, claim 27, in its present form, should be allowed.

Claim 28 is dependent on claim 27 which is dependent on amended claim 21. For the reasons set forth above with regard to the non-obviousness of claim 21, claim 28 should also be non-obvious and should be allowed in its present form.

The Examiner has rejected claims 22, 23, 25, 29 and 30 are rejected under 35 U.S.C. 103 as being unpatentable over Tao et al. in view of Yakov Gershman, Non Patent Literature Document, cited by applicant submitted IDS filed on 10/18/2018, entitled "A simple way to determine the sex of one-day poultry chickens (basic principles)". The Examiner states that as to claim 25, Tao et al. as modified discloses wherein the library of digital images is limited to those of the chick's breed (e.g., male or female or bred species, see page 1 of Yakov Gershman). Applicant disagrees.

Claims 22 and 23 have been cancelled. Thus, rejection of these claims is moot. Claim 25 is dependent from amended claim 21. As argued above, claim 21 is not rendered obvious by Tao et al. It should follow that claim 25, as dependent from claim 21 is not rendered obvious by Tao et al. in view of Gersham. Accordingly, claim 25, in its present form, should be allowed.

Claim 29 depends on claim 28 which depends on claim 27 which depends from amended claim 21. For the same reasons set forth above with regard to claim 21, claim 29 is not rendered obvious by Tao et al. in view of Gersham. Claim 29 has been amended to read as follows:

29. (Currently amended) The system of claim 28 ~~9~~ wherein the angled conveyor has a near end and a far end and the far end is lower than the near end ~~further comprising a database having a library of digital images, the database in communication with the computer processor~~.

Applicant submits that Tao et al. teaches away from claim 29 in that the conveyor system of Tao et al. is horizontal. "The motion of the conveyor 13 in FIG. 1 is represented from left to right." Tao et al., Col. 3, lines 67-68. In addition, all figures in the Tao et al. patent display the conveyors operating in a horizontal manner. Thus, Tao et al. teaches the movement of chicks through its system in a horizontal fashion. Conversely, claim 29 is directed to a system having an angled conveyor where the far end of the conveyor is lower than the near end and in which the chick travels in a downwardly direction as it advances along the conveyor as shown in Figures 4, 5 and 6 of the specification. Because Tao et al. teaches away from the system of claim 29, claim 29 cannot be rendered obvious by Tao et al. in view of Gersham.

Claim 30 depends from claim 29 which depends on claim 28 which depends on claim 27 which depends on independent claim 21. Claim 30 has been amended to read as follows:

> 30. (Currently amended) The system of claim 29 wherein the angled conveyor is oriented at an angle e to the horizon ~~level of deviation is determined by comparing the image captured by the image capture device to the library of digital images~~.

Like claim 29, amended claim 30 is directed to an angled conveyor. The conveyor in amended claim 30 has a near end and a far end and the far end is lower than the near end and forms an angle e with the horizon. The The angled conveyor is designed to cause unrestrained chicks to become unbalanced and/or lose their footing. This causes an instinctive reflex of opening wings or wing flapping to occur in an attempt to regain footing and/or balance. The opening of the chick's wings enables the image capture device to capture an image of the chick's wing pattern or to obtain an image of one or more of the chick's features unobstructed by the wings.

As discussed above, Tao et al. teaches a system having a horizontal conveyor and transporting restrained chicks in an exclusively horizontal fashion. This manner of transport of the chicks teaches away from the system of amended claim 30. Where the

proposed modification of a reference destroys the intent, purpose or function of the invention, such a proposed modification is improper and the prima facie case of obviousness cannot be made. In re Gordon, 773, F.2d 900, 221 USPQ 1125 (Fed.Cir. 1984). Here the system of Tao et al. cannot be modified with an angled conveyor because the chick retaining device would be rendered ineffective as the chicks would likely slide off of the retaining device with an angled movement. For this reason, Tao et al. in view of Gersham cannot render amended claim 30 obvious. Claim 30 should be allowed in its amended form.

CONCLUSION

In view of the foregoing amendments and remarks, allowance of all pending claims is courteously solicited. The Office is respectfully invited to contact the undersigned at (919) 342-4887 to discuss any matter relating to this application.

Respectfully submitted,

/kmlynch/

Kathleen M. Lynch

Date: February 5, 2020 Reg. No. 33957

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/775,706	Filing Date 05/11/2018	☐ To be Mailed

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 $230 =	
☐ 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

AMENDMENT	02/05/2020	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 18	Minus	** 20	= 0		x $50 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $230 =	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		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	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".	/LISA E FULTON/
*** 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 number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. 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 12 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.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/775,706	05/11/2018	Ramin Karimpour	374-2	3566

90741 7590 11/05/2019

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EXAMINER	
POPOVICI, DOV	

ART UNIT	PAPER NUMBER
2677	

NOTIFICATION DATE	DELIVERY MODE
11/05/2019	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):

klynch@kliplaw.com
kml@lynchvansickle.com
lynchbunch@kliplaw.com

Office Action Summary	**Application No.** 15/775,706	**Applicant(s)** Karimpour, Ramin	
	Examiner DOV POPOVICI	**Art Unit** 2677	**AIA (FITF) Status** Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 11 May 2018.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ 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.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-3,7-10 and 21-34 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-3,7-10 and 21-34 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, 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.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 11 May 2018 is/are: a)☐ accepted or b)☑ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ 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)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

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.

Information Disclosure Statement

The IDS filed 10/18/2018 have been considered except for US 20100019802 which indicates in the IDS publication date of 08-05-2010 and the name or applicant as Elazari-Volcani et al. However, US 2010/0019802 has a publication date of 1-28-2010 and the applicant is Huang et al. thus, the reference listed in the IDS was crossed out.

Drawings

The drawings are objected to because empty blocks 46, 16, and 40 in figure 7 must be labelled. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or

"New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Interpretation

The following is a quotation of 35 U.S.C. 112(f):

> (f) Element in Claim for a Combination. – An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The following is a quotation of pre-AIA 35 U.S.C. 112, sixth paragraph:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The claims in this application are given their broadest reasonable interpretation using the plain meaning of the claim language in light of the specification as it would be understood by one of ordinary skill in the art. The broadest reasonable interpretation of a claim element (also commonly referred to as a claim limitation) is limited by the description in the specification when 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is invoked.

As explained in MPEP § 2181, subsection I, claim limitations that meet the following three-prong test will be interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph:

(A) the claim limitation uses the term "means" or "step" or a term used as a substitute for "means" that is a generic placeholder (also called a nonce term or a non-

structural term having no specific structural meaning) for performing the claimed function;

(B) the term "means" or "step" or the generic placeholder is modified by functional language, typically, but not always linked by the transition word "for" (e.g., "means for") or another linking word or phrase, such as "configured to" or "so that"; and

(C) the term "means" or "step" or the generic placeholder is not modified by sufficient structure, material, or acts for performing the claimed function.

Use of the word "means" (or "step") in a claim with functional language creates a rebuttable presumption that the claim limitation is to be treated in accordance with 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim limitation is interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when the claim limitation recites sufficient structure, material, or acts to entirely perform the recited function.

Absence of the word "means" (or "step") in a claim creates a rebuttable presumption that the claim limitation is not to be treated in accordance with 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim limitation is not interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when the claim limitation recites function without reciting sufficient structure, material or acts to entirely perform the recited function.

Claim limitations in this application that use the word "means" (or "step") are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action. Conversely, claim limitations in this

application that do not use the word "means" (or "step") are not being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action.

This application includes one or more claim limitations that do not use the word "means," but are nonetheless being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, because the claim limitation(s) uses a generic placeholder that is coupled with functional language without reciting sufficient structure to perform the recited function and the generic placeholder is not preceded by a structural modifier. Such claim limitation(s) is/are: removing means, in claim 21.

Figure 2 shows first angled conveyor 20 (see page 8, lines 9-15) and the second angled conveyor 38 (see page 9, lines 6-17), is/are interpreted to read on: removing means in claim 21.

Because this/these claim limitation(s) is/are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, it/they is/are being interpreted to cover the corresponding structure described in the specification as performing the claimed function, and equivalents thereof.

If applicant does not intend to have this/these limitation(s) interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, applicant may: (1) amend the claim limitation(s) to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph (e.g., by reciting sufficient structure to perform the claimed function); or (2) present a sufficient showing that the claim limitation(s) recite(s) sufficient structure to perform the claimed function so as to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims **1**-**3**, **7**-**10** and **21**-**34** are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the **written description** requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim **1**, line 9, recites "the computer processor calculates a level of deviation of the image" is not described in the specification, and fails to comply with the written description requirement. In the specification, in page 5, line 21, the specification recites "computer processor 32 is designed to receive and process the images from the cameras 18". In page 8, line 2, the specification recites "The computer processor 32 processes the images and compares them with". However, the specification fails to describe that "the computer processor calculates a level of deviation of the image", thus, the specification fails to comply with the written description requirement.

Claims 2-3, 7-8 and 31-32 are rejected because they are dependent on rejected independent claim 1 above.

Claim **9**, lines 10-11, recites "the computerized image processor determines the level of deviation of the image of the chick" is not described in the specification, and fails to comply with the written description requirement. In the specification, in page 5, line 21, the specification recites "computer processor 32 is designed to receive and process the images from the cameras 18". In page 8, line 2, the specification recites "The computer processor 32 processes the images and compares them with". However, the specification fails to describe "the computerized image processor determines the level of deviation of the image of the chick", thus, the specification fails to comply with the written description requirement.

Claims 10, 29-30 and 33 are rejected because they are dependent on rejected independent claim 9 above.

Claim **21**, lines 6-7, and 10-13, recite "the computer processor capable of processing images and determining deviation from a predetermined value" and "the computer processor processes the image and determines the level of deviation of the chick's predetermined feature, if the level of deviation exceeds a predetermined value, the computer processor communicates with the removing means to remove the chick from the moving platform" is not described in the specification, and fails to comply with the written description requirement. In the specification, in page 5, line 21, the specification recites "computer processor 32 is designed to receive and process the images from the cameras 18". In page 8, line 2, the specification recites "The computer processor 32 processes the images and compares them with". However, the

specification fails to describe "the computer processor capable of processing images and determining deviation from a predetermined value" and "the computer processor processes the image and determines the level of deviation of the chick's predetermined feature, if the level of deviation exceeds a predetermined value, the computer processor communicates with the removing means to remove the chick from the moving platform", thus, the specification fails to comply with the written description requirement.

Claims 22-28 and 34 are rejected because they are dependent on rejected independent claim 21 above.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims **1-3**, **7-10** and **21-34** are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as **failing to comply with the *enablement* requirement**. The claim(s) contains subject matter which was not described in the specification in such a way as ***to enable*** one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim **1**, line 9, recites "the computer processor calculates a level of deviation of the image" is not described in the specification, and fails to comply with the ***enablement*** requirement. In the specification, in page 5, line 21, the specification recites "computer processor 32 is designed to receive and process the images from the cameras 18". In page 8, line 2, the specification, recites "The computer processor 32 processes the images and compares them with". However, the specification fails to describe that "the computer processor calculates a level of deviation of the image", thus, the specification fails to comply with the ***enablement*** requirement.

The claim(s) (e.g., claim 1) contains subject matter (e.g., "the computer processor **calculates a level of deviation of the image**") which was not described in the specification in such a way as ***to enable*** one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 2-3, 7-8 and 31-32 are rejected because they are dependent on rejected independent claim 1 above.

Claim **9**, lines 10-11, recites "the computerized image processor **determines the level of deviation of the image of the chick**" is not described in the specification, and fails to comply with the **enablement** requirement. In the specification, in page 5, line 21, the specification, recites "computer processor 32 is designed to receive and process the images from the cameras 18". In page 8, line 2, the specification, recites "The computer processor 32 processes the images and compares them with". However, the specification fails to describe "the computerized image processor determines the level of deviation of the image of the chick", thus, the specification fails to comply with the enablement requirement.

The claim(s) (e.g., claim **9**) contains subject matter (e.g., "the computerized image processor **determines the level of deviation of the image of the chick**") which was not described in the specification in such a way as ***to enable*** one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 10, 29-30 and 33 are rejected because they are dependent on rejected independent claim 9 above.

Claim **21**, lines 6-7, and 10-13, recite "the computer processor capable of processing images **and determining deviation from a predetermined value**" and "the computer processor processes the image **and determines the level of deviation of the chick's predetermined feature**, **if the level of deviation exceeds a predetermined value**, **the computer processor communicates with the removing means to remove the chick from the moving platform**" is not described in the specification, and fails to comply with the **enablement** requirement. In the specification, in page 5, line 21, the specification, recites "computer processor 32 is designed to receive and process the images from the cameras 18". In page 8, line 2, the specification, recites "The computer processor 32 processes the images and compares them with". However, the specification fails to describe "the computer processor capable of processing images and determining deviation from a predetermined value" and "the computer processor processes the image and determines the level of deviation of the chick's predetermined feature, if the level of deviation exceeds a predetermined value, the computer processor communicates with the removing means to remove the chick

from the moving platform", thus, the specification fails to comply with the enablement requirement.

The claim(s) (e.g., claim **21**) contains subject matter (e.g., "the computer processor capable of processing images **and determining deviation from a predetermined value**" and "the computer processor processes the image **and determines the level of deviation of the chick's predetermined feature**, **if the level of deviation exceeds a predetermined value**, **the computer processor communicates with the removing means to remove the chick from the moving platform**") which was not described in the specification in such a way as ***to enable*** one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 22-28 and 34 are rejected because they are dependent on rejected independent claim 21 above.

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112**(b):**
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), **second paragraph**:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims **1-3**, **7-10** and **21-34** are rejected under 35 U.S.C. 112**(b)** or 35 U.S.C. 112 (pre-AIA), **second paragraph**, as being ***indefinite*** for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claim **1**, line 9, recites "the computer processor calculates a level of deviation of the image" is unclear, vague and indefinite in the context of the claim. The examiner referred to the specification for clarity and the specification describes in page 5, line 21, the specification recites "computer processor 32 is designed to receive and **process the images** from the cameras 18" and in page 8, line 2, the specification recites "The computer processor 32 **processes the images** and compares them with". However, the specification fails to describe that "the computer processor **calculates a level of deviation of the image**". Therefore, it is unclear, vague and indefinite in the context of the claim as to how the processor calculates a level of deviation of the image as claimed?

Claims 2-3, 7-8 and 31-32 are rejected because they are dependent on rejected independent claim 1 above.

Claim **2** recites the limitation "the camera" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim **33** recites the limitation "the calculated level of deviation" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim **9**, lines 10-11, recites "the computerized image processor determines the level of deviation of the image of the chick" is unclear, vague and indefinite in the context of the claim. The examiner referred to the specification for clarity and the specification describes in page 5, line 21, the specification recites "computer processor 32 is designed to receive and **process the images** from the cameras 18" and in page 8, line 2, the specification recites "The computer processor 32 **processes the images** and compares them with". However, the specification fails to describe that "the

computerized image processor determines the level of deviation of the image of the chick". Therefore, it is unclear, vague and indefinite in the context of the claim as to how the processor determines the level of deviation of the image of the chick, as claimed?

Claims 10, 29-30 and 33 are rejected because they are dependent on rejected independent claim 9 above.

Claim **21**, lines 6-7, and 10-13, recite "the computer processor capable of processing images and determining deviation from a predetermined value" and "the computer processor processes the image and determines the level of deviation of the chick's predetermined feature, if the level of deviation exceeds a predetermined value, the computer processor communicates with the removing means to remove the chick from the moving platform" is unclear, vague and indefinite in the context of the claim.

The examiner referred to the specification for clarity and the specification describes in page 5, line 21, the specification recites "computer processor 32 is designed to receive and **process the images** from the cameras 18" and in page 8, line 2, the specification recites "The computer processor 32 **processes the images** and compares them with". However, the **specification fails to describe** "the computer processor capable of processing images and determining deviation from a predetermined value" and "the computer processor processes the image and determines the level of deviation of the chick's predetermined feature, if the level of deviation exceeds a predetermined value, the computer processor communicates with the removing means to remove the chick from the moving platform", thus, it is unclear, vague and indefinite in the context of the claim as to how "the computer **processor** capable of processing images **and determining deviation from a predetermined**

value" and "the computer processor processes the image **and determines the level of deviation of the chick's predetermined feature**, **if the level of deviation exceeds a predetermined value**, **the computer processor communicates with the removing means to remove the chick from the moving platform**", as claimed?

Claims 22-28 and 34 are rejected because they are dependent on rejected independent claim 21 above.

Claim Rejections - 35 USC § 103

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

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, 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**, **2, 3** and **32** are rejected under 35 U.S.C. 103 as being unpatentable over **Tao et al.** (US 6,396,938 B1) in view of **Yavnai et al.** (US 2001/0035370 A1), cited by applicant submitted **IDS** filed on **10/18/2018**.

As to claim **1**, **Tao et al.** discloses a system for determining the sex of a chick comprising: a moving platform to support a chick (see col. 3, lines 60-67, conveyer 13

and the motion of conveyer 13 is left to right); at least one UV (17); an image capture device (camera 15) to capture at least one image of the chick; and a computer processor (image processor 21) in communication with the image capture device (15), whereby the image capture device (15) captures at least one image of the chick and transmits it to the computer processor (21) where the image is processed and the computer processor (21) calculates a level of deviation of the image (see col. 5 lines 35 to col. 6, line 1, e.g., processor 21 identify longer feathers and feather shanks 47, and shorter feathers and feather shanks 45 are identified using edge detection, identify that of a female chick and male chick wing after appropriate processing by image processor 21.)

Tao et al. does not specifically specify that the at least one UV (17) is a stimuli to cause the chick to open its wings.

Yavnai et al. teaches a method of automatic sexing of chicks, applying appropriate image processing to the photograph (see title and abstract), having at least one stimuli (e.g., see par 36, and 38, i.e., light source 44 shines light 46 on chick 10 whose wings are spread, par 42, vibrator 58, see par 36, vibrating) to cause the chick to open its wings.

Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have modified **Tao et al.** wherein the at least one UV (17) is a stimuli to cause the chick to open its wings.

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have modified **Tao et al.** by the teaching of **Yavnai et al.** to include, wherein the at least one UV (17) is a stimuli to cause the chick to open

its wings, because of at least one or more of the following reason(s): (**1**) so that sex identification, based on sex distinguishable wing feather patterns and the light source 44 shines light 46 on chick 10 whose wings are spread, making sex identification easier (see pars 38 and 39 as taught by, **Yavnai et al.** in pars 38-39); and/or (**2**) for the reasons stated in **Yavnai et al.** in par 0011 (e.g., by causing a chick to spread its wings automatically, rather than manually, reduces labor requirements, minimizes incorrect sex sorting, maintaining the integrity of the sexing process); and/or (**3**) and for the reasons taught by **Yavnai et al.** in par 0005 and for the reasons stated in pars 38, 39 and 42.

As to claim **2**, **Tao et al.** as modified discloses further comprising a master control system (23) in communication with the camera (15), moving platform (13), and computer processor (21).

As to claim **3**, **Tao et al.** as modified wherein the stimulus may be one or more (e.g., one or more requires only one) of the following group: an angled conveyor belt, a vibrating conveyor belt, a strobe light (e.g., light source 44 or LED 44, see par 38 in **Yavnai et al.**), or a stream of air blowing on the chick.

As to claim **32**, **Tao et al.** discloses a removing device (see figure 1, selective demount 27, rework receiver 33, female receiver 31 and/or male receiver 29, and see col. 6, lines 1-35, e.g., route the chicks in a sorting process) in communication with the computer processor (e.g., image processor 21), whereby when the computer calculated level of deviation exceeds a predetermined range, the removing device (27, 33, 31 and 29) is activated and removes a chick having a variance exceeding the predetermined

range (sorting process based on male or female, routed to male or female receiver) from the moving platform (13) (see col. 6, lines 1-35).

Claim Rejections - 35 USC § 103

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

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, 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 **7**-**8** and **31** are rejected under 35 U.S.C. 103 as being unpatentable over **Tao et al.** (US 6,396,938 B1) in view of **Yavnai et al.** (US 2001/0035370 A1), cited by applicant submitted **IDS** filed on **10/18/2018**, as applied to claim **1** above, and further in view of **Yakov Gershman**, Non Patent Literature Document, cited by applicant submitted **IDS** filed on **10/18/2018**, entitled "A simple wat to determine the sex of one-day poultry chickens (basic principles)".

As to claim **7**, **Tao et al.** as modified does not teach a database having a library of digital images.

Yakov Gershman teaches determining the sex of one day chickens, having **a database** having a library of digital images (see page 4, point 14, limiting the areas of males and females, and to place this data in memory of computer).

Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have modified **Tao et al.** as modified to include a database having a library of digital images.

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have modified **Tao et al.** as modified by the teaching of **Yakov Gershman** to include a database having a library of digital images, because of the following reason(s): so that digital images of the male and female feathers can be stored in a memory of a computer as taught by **Yakov Gershman** at page 4, point 14).

As to claim **8**, **Tao et al.** as modified discloses wherein the digital images are wing patterns (see **Yakov Gershman** at figures 1 and 2, and see page 1-2, and pages 3-4, and see points 1-14 in pages 3-4).

As to claim **31**, **Tao et al.** as modified discloses wherein the database has images particular to the chick's breed (e.g., male or female or bred species, see page 1 of **Yakov Gershman)**.

Claim Rejections - 35 USC § 102

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of

rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a)(1) the claimed invention was patented, described in a printed publication, or in public use, on sale or otherwise available to the public before the effective filing date of the claimed invention.

Claims **9-10**, **21**, **24**, **26** and **33-34** are rejected under 35 U.S.C. 102(a)(1) as being anticipated by **Tao et al.** (US 6,396,938 B1).

As to claim **9**, **Tao et al.** discloses a system for determining the health of a day old chick comprising: a moving platform (13) upon which a chick is supported positioned; image capturing device (15) to capture at least one electronic image of a predetermined area of the chick; computerized image processor (21) in communication with the image capture device (15), whereby the image capture device (15) captures at least one image of the chick, and it is transmitted to the computerized image processor (21) where the computerized image processor (21) determines the level of deviation of the image of the chick (see col. 5, line 36 to col. 6, line 34).

As to claim **10**, **Tao et al.** inherently discloses wherein the predetermined area is that of the feet, face, abdomen or legs (see figure 1, and see col. 5, line 35 to col. 6, line 35, shanks 45, 47).

As to claim **33**, **Tao et al.** discloses a removing device (see figure 1, selective demount 27, rework receiver 33, female receiver 31 and/or male receiver 29, and see col. 6, lines 1-35, e.g., route the chicks in a sorting process) in communication with the

computerized image processor (e.g., image processor 21), whereby when the calculated level of deviation exceeds a predetermined range, the removing device (27, 33, 31 and 29) is activated and removes a chick having a variance exceeding the predetermined range (sorting process based on male or female, routed to male or female receiver) from the moving platform (13) (see col. 6, lines 1-35).

As to claim **21**, **Tao et al.** discloses a system of sorting chicks on the basis of a predetermined feature of a chick comprising: a moving platform to support a chick (13); an image capture device (15) positioned proximate to the moving platform (13) to capture at least one image of the chick as it passes on the moving platform (13); a computer processor (21) in communication with the image capture device (15), the computer processor (21) capable of processing images and determining deviation from a predetermined value; and removing means (27, 33, 31, 29) for removing a chick from the moving platform (13), the removing means in communication with the computer processor (21), whereby when the image capture device (15) takes an image of the chick and transmits it to the computer processor (21), the computer processor (21) processes the image and determines the level of deviation of the chick's predetermined feature, if the level of deviation exceeds a predetermined value, the computer processor (21) communicates with the removing means (27, 33, 31, 29) to remove the chick from the moving platform (13) (see col. 3, lines 60-67, col. 4, lines 1-30 and col. 5, lines 35 to col. 6, line 35).

As to claim **24**, **Tao et al.** inherently discloses wherein the predetermined feature is the wing, the abdomen, or the foot (see figure 1, and see col. 5, line 35 to col. 6, line 35, shanks 45, 47, wing image 51, 41).

As to claim **26**, **Tao et al.** discloses a removing device (see figure 1, selective demount 27, rework receiver 33, female receiver 31 and/or male receiver 29, and see col. 6, lines 1-35, e.g., route the chicks in a sorting process) in communication with the computer processor (e.g., image processor 21) and activated when the computer processor (21) determines the level of deviation of a chick exceeds a predetermined range, the removing device (27, 33, 31 and 29) removes a chick having a variance exceeding the predetermined range (sorting process based on male or female, routed to male or female receiver) from the moving platform (13) (see col. 6, lines 1-35).

As to claim **34**, **Tao et al.** discloses wherein the removing device (27, 33, 31, 29 and 13) comprises a moving platform position altering device (13).

Claim Rejections - 35 USC § 103

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

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, 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 **27** and **28** are rejected under 35 U.S.C. 103 as being unpatentable over **Tao et al.** (US 6,396,938 B1) in view of **Yavnai et al.** (US 2001/0035370 A1), cited by applicant submitted **IDS** filed on **10/18/2018**.

As to claim **27**, **Tao et al.** discloses at least one UV (17) (see figure 1) proximate to the moving platform (13).

Tao et al. does not specifically specify that the at least one UV 17 is a stimuli.

Yavnai et al. teaches a method of automatic sexing of chicks, applying appropriate image processing to the photograph (see title and abstract), having at least one stimuli (e.g., see par 36, and 38, i.e., light source 44 shines light 46 on chick 10 whose wings are spread, par 42, vibrator 58, see par 36, vibrating) to cause the chick to open its wings.

Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have modified **Tao et al.** wherein the at least one UV (17) is a stimuli.

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have modified **Tao et al.** by the teaching of **Yavnai et al.** to include, wherein the at least one UV (17) is a stimuli, because of at least one or more of the following reason(s): (**1**) so that sex identification, based on sex distinguishable wing feather patterns and the light source 44 shines light 46 on chick 10 whose wings are spread, making sex identification easier (see pars 38 and 39 as taught by, **Yavnai et al.** in pars 38-39); and/or (**2**) for the reasons stated in **Yavnai et al.** in par 0011 (e.g., by causing a chick to spread its wings automatically, rather than manually, reduces labor requirements, minimizes incorrect sex sorting, maintaining the integrity of

the sexing process); and/or (**3**) and for the reasons taught by **Yavnai et al.** in par 0005 and for the reasons stated in pars 38, 39 and 42.

As to claim **28**, **Tao et al.** as modified discloses wherein the stimulus may be one or more (e.g., one or more requires only one) of the following group: an angled conveyor belt, a vibrating conveyor belt, a strobe light (e.g., light source 44 or LED 44, see par 38 in **Yavnai et al.**), or a stream of air blowing on the chick.

Claim Rejections - 35 USC § 103

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

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, 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 **22**, **23**, **25**, **29** and **30** are rejected under 35 U.S.C. 103 as being unpatentable over **Tao et al.** (US 6,396,938 B1) in view of **Yakov Gershman**, Non Patent Literature Document, cited by applicant submitted **IDS** filed on **10/18/2018**, entitled “A simple wat to determine the sex of one-day poultry chickens (basic principles)”.

As to claim **29**, **Tao et al.** does not teach a database having a library of digital images, the database in communication with the computer processor.

Yakov Gershman teaches determining the sex of one day chickens, having **a database** having a library of digital images (see page 4, point 14, limiting the areas of males and females, and to place this data in memory of computer), the database in communication with the computer processor (see page 3-4, received images will passed to the computer, and begin their examination by using image processing software, point 3, and place this data in memory of computer, point 14).

Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have modified **Tao et al.** as modified to include a database having a library of digital images, the database in communication with the computer processor

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have modified **Tao et al.** as modified by the teaching of **Yakov Gershman** to include a database having a library of digital images, the database in communication with the computer processor, because of the following reason(s): so that digital images of the male and female feathers can be stored in a memory of a computer as taught by **Yakov Gershman** at page 4, point 14).

As to claim **30**, **Tao et al.** as modified discloses wherein the level of deviation is determined by comparing the image captured by the image capture device (15) to the library of digital images (see page 4, point 14, limiting the areas of males and females, and to place this data in memory of computer, see **Yakov Gershman** at page 4, point 14).

As to claim **22**, **Tao et al.** does not teach a database having a library of digital images of a predetermined feature of the chick.

Yakov Gershman teaches determining the sex of one day chickens, having **a database** having a library of digital images (see page 4, point 14, limiting the areas of males and females, and to place this data in memory of computer), of a predetermined feature of the chick.

Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have modified **Tao et al.** as modified to include a database having a library of digital images of a predetermined feature of the chick.

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have modified **Tao et al.** as modified by the teaching of **Yakov Gershman** to include a database having a library of digital images of a predetermined feature of the chick, because of the following reason(s): so that digital images of the male and female feathers can be stored in a memory of a computer as taught by **Yakov Gershman** at page 4, point 14).

As to claim **23**, **Tao et al.** as modified discloses wherein the level of deviation is determined from a comparison of the captured image to the library of digital images (see page 4, point 14, limiting the areas of males and females, and to place this data in memory of computer, see **Yakov Gershman** at page 4, point 14).

As to claim **25**, **Tao et al.** as modified discloses wherein the library of digital images is limited to those of the chick's breed (e.g., male or female or bred species, see page 1 of **Yakov Gershman)**.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DOV POPOVICI whose telephone number is (571)272-4083. The examiner can normally be reached on Monday - Friday 8:00 am- 4:30 pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, TAMMY GODDARD can be reached on 571-272-7773. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DOV POPOVICI/
Primary Examiner, Art Unit 2677

Notice of References Cited	Application/Control No. 15/775,706	Applicant(s)/Patent Under Reexamination Karimpour, Ramin	
	Examiner DOV POPOVICI	Art Unit 2677	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-6396938-B1	05-2002	Tao; Yang	G06K9/2018	209/509
	B					
	C					
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
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	Q					
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NON-PATENT DOCUMENTS

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

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/775,706	Karimpour, Ramin
	Examiner	Art Unit
	DOV POPOVICI	2677

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* 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
"((A01K13/003 OR A01K45/00 OR A01K61/13 OR A61B2503/40 OR A61B2576/00 OR A61B5/0033 OR A61B5/0077 OR A61B5/43 OR A61B5/70 OR A61B5/7282 OR A61D17/00 OR A61D19/00 OR A61D1/025 OR A61D3/00 OR A61D7/00 OR A61M2250/00 OR A61M5/30 OR A61M5/427 OR B65G15/30 OR B65G2201/02 OR G06T2207/30128 OR G06T7/001 OR G16H20/17 OR G16H50/20 OR Y02A90/26).CPC.) (limited by text search, see attached East Search History)"	10/29/2019 and 10/31/2019	/D.P./
"382/110 (limited by text search, see attached East Search History)"	10/29/2019 and 10/31/2019	/D.P./
East Search - See attached East Search History	10/29/2019 and 10/31/2019	/D.P./
Inventor Name Search - See attached East Search History	10/31/2019	/D.P./
Consulted with Gabriel I. Garcia regarding prior art and 35 U.S.C. 112(f), (a) and (b)	10/31/2019	/D.P./

	/DOV POPOVICI/ Primary Examiner, Art Unit 2677

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/775,706	Karimpour, Ramin
	Examiner	Art Unit
	DOV POPOVICI	2677

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
Inventor Name Search - See attached East Search History		10/31/2019	/D.P./

	/DOV POPOVICI/ Primary Examiner, Art Unit 2677

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/775,706	Karimpour, Ramin
	Examiner	Art Unit
	DOV POPOVICI	2677

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

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

CLAIM		DATE								
Final	Original	11/01/2019								
	1	✓								
	2	✓								
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CONFIRMATION NO. 3566

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
15/775,706	05/11/2018	382	2677	374-2

APPLICANTS
Applied LifeSciences and Systems, LLC, Raleigh, NEW CALEDONIA

INVENTORS
Ramin Karimpour, Raleigh, NC;

**** CONTINUING DATA **************************** Yes /D.P./
This application is a 371 of PCT/US2016/061536 11/11/2017
which claims benefit of 62/349,981 06/14/2016
and claims benefit of 62/254,737 11/13/2015

**** FOREIGN APPLICATIONS **************************** None /D.P./

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **
08/30/2018

Foreign Priority claimed ❑ Yes ☑ No 35 USC 119(a-d) conditions met ❑ Yes ☑ No Verified and Acknowledged /DOV POPOVICI/ Examiner's Signature	❑ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		NC	7	21	3

ADDRESS

Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518
UNITED STATES

TITLE

System and Method of Determining the Health and Gender of a Chick

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 2 of 3

Complete if Known	
Application Number	15775706
Filing Date	May 11, 2018
First Named Inventor	Karimpour, Ramin
Art Unit	
Examiner Name	
Attorney Docket Number	

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
/D.P/		US- 20010035370	11-1-2001	Yavnai et al.	Para.0037-0039, 0042-0043
/D.P/		US- 20050098121	05-12-2005	Gorans et al.	Para. 03, 14, 16, 38, 82-83
/D.P/		US- 20150289478	10-15-2015	Animal Biotech LLC	Para. 59, 71, 83-84,217, 228
/D.P/		US- 20090000915	01-01-2009	Nadreau	all
/D.P/		US- 20140069336	03-13-2014	McKay	all
/D.P/		US- 20140155756	06-05-2014	Faunus Ltd.	all
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
/D.P/		EP 2579188	10-04-2013	Weekers	Par13,17,19,22,27-28	
/D.P/		WO/2014/118788A2	08-07-2014	Faunus Ltf.	Page 11,line 16-21;	
					Page 44,line 26-32;	
					P 59,lines 5-6,23-26	

Examiner Signature	/DOV POPOVICI/	Date Considered	10/29/2019

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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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.

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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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.P/

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	("20010035370").PN.	US-PGPUB	OR	OFF	2019/10/29 07:19
S2	1	("20050098121").PN.	US-PGPUB	OR	OFF	2019/10/29 07:21
S3	1	("20150289478").PN.	US-PGPUB	OR	OFF	2019/10/29 07:21
S4	1	("20090000915").PN.	US-PGPUB	OR	OFF	2019/10/29 07:22
S5	1	("20140069336").PN.	US-PGPUB	OR	OFF	2019/10/29 07:23
S6	1	("20140155756").PN.	US-PGPUB	OR	OFF	2019/10/29 07:23
S7	1	("3994292").PN.	USPAT	OR	OFF	2019/10/29 07:56
S8	1	("5101767").PN.	USPAT	OR	OFF	2019/10/29 07:57
S9	1	("5626101").PN.	USPAT	OR	OFF	2019/10/29 09:05
S10	1	("7004112").PN.	USPAT	OR	OFF	2019/10/29 09:06
S11	1	("7066112").PN.	USPAT	OR	OFF	2019/10/29 09:07
S12	1	("7367284").PN.	USPAT	OR	OFF	2019/10/29 09:07

S13	1	("8019125").PN.	USPAT	OR	OFF	2019/10/29 09:08
S14	1	("8297231").PN.	USPAT	OR	OFF	2019/10/29 09:09
S15	1	("8677941").PN.	USPAT	OR	OFF	2019/10/29 09:10
S16	1	("20100019802").PN.	US-PGPUB	OR	OFF	2019/10/29 09:11
S17	1	("20130125835").PN.	US-PGPUB	OR	OFF	2019/10/29 09:12
S18	1	("4417663").PN.	USPAT	OR	OFF	2019/10/29 09:14
S19	1	("6029080").PN.	USPAT	OR	OFF	2019/10/29 09:15
S20	1	("6396938").PN.	USPAT	OR	OFF	2019/10/29 10:35
S21	1	("6512839").PN.	USPAT	OR	OFF	2019/10/29 10:36
S22	1	("8019125").PN.	USPAT	OR	OFF	2019/10/29 10:37
S23	1	("9179651").PN.	USPAT	OR	OFF	2019/10/29 10:37
S24	1	"15775706"	US-PGPUB; USPAT	OR	OFF	2019/10/29 10:39
S25	1	"15775706" and (calculat$5 with deviat$5)	US-PGPUB; USPAT	OR	ON	2019/10/29 10:41
S26	239	(determin$5 with sex with chick$5)	US-PGPUB; USPAT; USOCR;	OR	ON	2019/10/29 10:42

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S27	3	(determin$5 with sex with chick$5) and (mov$3 with platform)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 10:44
S28	154	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 10:46
S29	56	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (camera or (image with captur$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 10:47
S30	20	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2019/10/29 10:48

		(camera or (image with captur$4)) and (database)	DERWENT; IBM_TDB			
S31	3	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (camera or (image with captur$4)) and (database) and (wing with pattern$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 10:49
S32	3	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (camera or (image with captur$4)) and (database) and (wing$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 10:49
S33	1	"20010035370" and (process$5)	US-PGPUB; USPAT	OR	ON	2019/10/29 16:01
S34	3	"09416262"	US-PGPUB; USPAT	OR	ON	2019/10/29 16:15
S35	1	(determin$5 with sex with chick$5) and (deviat$5 with image)	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2019/10/29 16:46

			EPO; JPO; DERWENT; IBM_TDB			
S36	2	"15775706"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 16:47
S37	131792	((A01K13/003 OR A01K45/00 OR A01K61/13 OR A61B2503/40 OR A61B2576/00 OR A61B5/0033 OR A61B5/0077 OR A61B5/43 OR A61B5/70 OR A61B5/7282 OR A61D17/00 OR A61D19/00 OR A61D1/025 OR A61D3/00 OR A61D7/00 OR A61M2250/00 OR A61M5/30 OR A61M5/427 OR B65G15/30 OR B65G2201/02 OR G06T2207/30128 OR G06T7/001 OR G16H20/17 OR	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 16:48

		G16H50/20 OR Y02A90/26).CPC.)				
S38	1863	382/110	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 16:49
S39	133416	S37 or S38	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 16:49
S40	239	(determin$5 with sex with chick$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 16:49
S41	43	S39 and S40	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/29 16:49

S42	154	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 09:48
S43	131854	((A01K13/003 OR A01K45/00 OR A01K61/13 OR A61B2503/40 OR A61B2576/00 OR A61B5/0033 OR A61B5/0077 OR A61B5/43 OR A61B5/70 OR A61B5/7282 OR A61D17/00 OR A61D19/00 OR A61D1/025 OR A61D3/00 OR A61D7/00 OR A61M2250/00 OR A61M5/30 OR A61M5/427 OR B65G15/30 OR B65G2201/02 OR G06T2207/30128 OR G06T7/001 OR G16H20/17 OR G16H50/20 OR Y02A90/26).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 09:48
S44	1863	382/110	US-	OR	ON	2019/10/31

			PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			09:48
S45	133478	S43 or S44	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 09:48
S46	28	S45 and S42	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 09:48
S47	193	(sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (deviat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 09:53
S48	15	(sex with chick$5) and (stimuli or belt or conveyor or vibrat$4	US-PGPUB; USPAT;	OR	ON	2019/10/31 09:53

		or light or strobe or air or blow$3) and (deviat$5) and S45	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S49	239	(determin$5 with sex with chick$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 09:55
S50	43	S45 and S49	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 09:55
S51	56	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (camera or (image with captur$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:19
S52	18	S45 and S51	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2019/10/31 10:19

			EPO; JPO; DERWENT; IBM_TDB			
S53	20	(determin$5 with sex with chick$5) and (stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) and (camera or (image with captur$4)) and (database)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:20
S54	10	S45 and S53	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:20
S55	1	(sex with chick$5) and ((stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) with wing$4) and (deviat$5) and S45	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:46
S56	20	(determin$5 with sex with chick$5) and ((stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) with	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2019/10/31 10:47

		wing$5)	DERWENT; IBM_TDB			
S57	7	(determin$5 with sex with chick$5) and ((stimuli or belt or conveyor or vibrat$4 or light or strobe or air or blow$3) with (open or opening or open$3) with wing$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:50
S58	72	(Karimpour near5 Ramin).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:52
S59	2	(Karimpour near5 Ramin).in. and (sex with chick$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:52
S60	6	(Karimpour near5 Ramin).in. and (stimuli with wing)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2019/10/31 10:53

			IBM_TDB			
S61	8	(Karimpour near5 Ramin).in. and (platform and ((image near5 capture) or camera))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/10/31 10:54

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S62	12	(Karimpour near5 Ramin).in.	US-PGPUB; USPAT	OR	ON	2019/10/31 10:54
S63	1	(Karimpour near5 Ramin).in. and (sex with chick$5)	US-PGPUB; USPAT	OR	ON	2019/10/31 10:55
S64	1	(Karimpour near5 Ramin).in. and (stimuli with wing)	US-PGPUB; USPAT	OR	ON	2019/10/31 10:55
S65	3	(Karimpour near5 Ramin).in. and (platform and ((image near5 capture) or camera))	US-PGPUB; USPAT	OR	ON	2019/10/31 10:55
S66	3	(Karimpour near5 Ramin).in. and	US-PGPUB;	OR	ON	2019/10/31 10:56

		(platform and ((image near5 capture) or camera)) and (computer or processor)	USPAT			
S67	2	(Karimpour near5 Ramin).in. and ((platform and ((image near5 capture) or camera)) and (computer or processor)).clm.	US-PGPUB; USPAT	OR	ON	2019/10/31 10:56
S68	1	(Karimpour near5 Ramin).in. and (platform and ((image near5 capture) or camera)) and (computer or processor) and (sex with chick$5)	US-PGPUB; USPAT	OR	ON	2019/10/31 10:57
S69	1	(Karimpour near5 Ramin).in. and (platform and ((image near5 capture) or camera)) and (computer or processor) and (stimuli with wing)	US-PGPUB; USPAT	OR	ON	2019/10/31 10:57

11/1/2019 8:41:35 AM
C:\Users\dpopovici\Documents\EAST\Workspaces\15775706_10_29_2019.wsp

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 3

Complete if Known	
Application Number	15775706
Filing Date	May 11, 2018
First Named Inventor	Karimpour, Ramin
Art Unit	
Examiner Name	
Attorney Docket Number	374-2

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
/D.P/		US-3994292	11-30-1976	Goodwin	Col. 2, lines 18-46
/D.P/		US-5101767	04-07-1992	Williams et al.	Col.2,line 48-Col.3,line 21
/D.P/		US-5626101	05-06-1997	Kuhl	Figs. 1&3; Col. 6, lines 7-19
/D.P/		US-7004112	05-12-2005	Gorans	Col.12,lines18-48;
		US-			Col. 13, lines 42-67;
		US-			Col. 14, lines 1-3
/D.P/		US-7066112	06-09-2005	Gorans	Col. 12, line 40-Col.14 line 7
/D.P/		US-7367284	09-01-2006	Gorans	Col. 12,line 30-Col. 3 line 60
/D.P/		US-8019125	01-09-2009	Nadreau et al.	Col. 5, line 56-Col. 6, line 9
/D.P/		US-8297231	08-05-2010	Yanai et al.	Col 11, lines 33-67
/D.P/		US-8677941	01-03-2013	Yanai et al.	Col. 11, lines 31-65
		US-20100019802	08-05-2010	Elazari-Volcani et al.	Para. 0135-0139
/D.P/		US-20130125835	05-23-2013	Sinn et al.	Para. 0037
/D.P/		US-4417663	11-29-1983	Suzuki	Col. 4, line 54-Col. 5 line 9
/D.P/		US-6029080	02-22-2000	Reynnels et al.	
/D.P/		US-6396938	05-28-2002	Tao et al.	Col. 5, line 26-Col. 5 line 9
/D.P/		US-6512839	01-28-2003	Toelken	Col. 5, lines 9-25
/D.P/		US-8019125	01-01-2009	Nadreau et al.	Col. 7,line 16-Col. 8 line 21
/D.P/		US-9179651	03-13-2014	McKay	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]

Examiner Signature	/DOV POPOVICI/	Date Considered	10/29/2019

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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 2 hours 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, 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.**

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Privacy Act Statement

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.P/

PTO/SB/08b (07-09)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 3 of 3

Complete if Known	
Application Number	15775706
Filing Date	May 11, 2018
First Named Inventor	Karimpour, Ramin
Art Unit	
Examiner Name	
Attorney Docket Number	374-2

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
/D.P/		GERSHMAN, Y. A simple way to determine the sex of one-day poultry chickens; The Papers of Independent Authors[online] Vol. 28, DNA 2014 [http://wiyrs.org/abs/1405.0016 pages	
/D.P/		GUY, TM et al., Development of Epileptic Activity in Embryos and Newly Hatched Chicks of the Fayoumi Mutant Chicken, Epilepsia, Vol. 36, No. 1, [illegible]	

Examiner Signature	/DOV POPOVICI/	Date Considered	10/29/2019

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

[1] Applicant's unique citation designation number (optional). [2] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 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 2 hours 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, 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 (1-800-786-9199) and select option 2.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.P/

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.
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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.

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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	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/775,706	05/11/2018	Ramin Karimpour	374-2

CONFIRMATION NO. 3566

90741
Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518

PUBLICATION NOTICE

OC000000104461606

Title: System and Method of Determining the Health and Gender of a Chick

Publication No.US-2018-0353081-A1
Publication Date:12/13/2018

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/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

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

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www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/775,706	05/11/2018	2668	650	374-2	21	3

CONFIRMATION NO. 3566

UPDATED FILING RECEIPT

90741
Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518

OC000000103389632

Date Mailed: 10/30/2018

Receipt is acknowledged of this non-provisional 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 APPLICANT, 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 Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections 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**

Inventor(s)

Ramin Karimpour, Raleigh, NC;

Applicant(s)

Applied LifeSciences and Systems, LLC, Raleigh, NEW CALEDONIA

Assignment For Published Patent Application

Applied LifeSciences and Systems, LLC, Raleigh, NC

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/US2016/061536 11/11/2017
which claims benefit of 62/349,981 06/14/2016
and claims benefit of 62/254,737 11/13/2015

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

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.

If Required, Foreign Filing License Granted: 08/30/2018

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/775,706**

Projected Publication Date: 12/13/2018

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

System and Method of Determining the Health and Gender of a Chick

Preliminary Class

382

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

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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.

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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.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/775,706

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	150		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	260		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	380		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	21 minus 20 =	* 1	x 50 =	50	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*	x 230 =	0.00			
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).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	840		TOTAL	

APPLICATION AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	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.

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U.S. APPLICATION NUMBER NO.	FIRST NAMED INVENTOR	ATTY. DOCKET NO.
15/775,706	Ramin Karimpour	374-2

90741
Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518

INTERNATIONAL APPLICATION NO.	
PCT/US2016/061536	
I.A. FILING DATE	PRIORITY DATE
11/11/2017	11/13/2015

CONFIRMATION NO. 3566
371 ACCEPTANCE LETTER

OC000000103389633

Date Mailed: 10/30/2018

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

The applicant is hereby advised that the United States Patent and Trademark Office, in its capacity as a Designated / Elected Office (37 CFR 1.495), has ACCEPTED the above identified international application for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above. A Filing Receipt will be issued for the present application in due course. **THE DATE APPEARING ON THE FILING RECEIPT AS THE "FILING DATE or 371(c) DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1) and (c)(2) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN BELOW.** The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363)

05/11/2018
DATE OF RECEIPT OF 35 U.S.C.
371(c)(1) and (c)(2) REQUIREMENTS

The following items have been received:

- Indication of Small Entity Status
- Copy of the International Application filed on 05/11/2018
- Copy of the International Search Report filed on 05/11/2018
- Preliminary Amendments filed on 05/11/2018
- Information Disclosure Statements filed on 10/18/2018
- Inventor's Oath or Declaration filed on 05/11/2018
- Request for Immediate Examination filed on 05/11/2018
- U.S. Basic National Fees filed on 05/11/2018
- Assignment filed on 05/11/2018
- Assignee Statement for PGPUB filed on 05/11/2018
- Authorize Access to Search Results filed on 05/11/2018
- Priority Documents filed on 05/11/2018
- Authorization to Permit Access filed on 05/11/2018
- Application Data Sheet (37 CFR 1.76) filed on 05/11/2018

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

ROSA M WEST

Telephone: (571) 272-1019

FORM PCT/DO/EO/903 (371 Acceptance Notice)

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. 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.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 2 of 3

Complete if Known	
Application Number	15775706
Filing Date	May 11, 2018
First Named Inventor	Karimpour, Ramin
Art Unit	
Examiner Name	
Attorney Docket Number	

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US- 20010035370	11-1-2001	Yavnai et al.	Para.0037-0039, 0042-0043
		US- 20050098121	05-12-2005	Gorans et al.	Para. 03, 14, 16, 38, 82-83
		US- 20150289478	10-15-2015	Animal Biotech LLC	Para. 59, 71, 83-84,217, 228
		US- 20090000915	01-01-2009	Nadreau	all
		US- 20140069336	03-13-2014	McKay	all
		US- 20140155756	06-05-2014	Faunus Ltd.	all
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
		EP 2579188	10-04-2013	Weekers	Par13,17,19,22,27-28	
		WO/2014/118788A2	08-07-2014	Faunus Ltf.	Page 11,line 16-21;	
					Page 44,line 26-32;	
					P 59,lines 5-6,23-26	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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 2 hours 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, 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.**

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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.
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Sheet 1 of 3

Complete if Known	
Application Number	15775706
Filing Date	May 11, 2018
First Named Inventor	Karimpour, Ramin
Art Unit	
Examiner Name	
Attorney Docket Number	374-2

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-3994292	11-30-1976	Goodwin	Col. 2, lines 18-46
		US-5101767	04-07-1992	Williams et al.	Col.2,line 48-Col.3,line 21
		US-5626101	05-06-1997	Kuhl	Figs. 1&3; Col. 6, lines 7-19
		US-7004112	05-12-2005	Gorans	Col.12,lines18-48;
		US-			Col. 13, lines 42-67;
		US-			Col. 14, lines 1-3
		US-7066112	06-09-2005	Gorans	Col. 12, line 40-Col.14 line 7
		US-7367284	09-01-2006	Gorans	Col. 12,line 30-Col. 3 line 60
		US-8019125	01-09-2009	Nadreau et al.	Col. 5, line 56-Col. 6, line 9
		US-8297231	08-05-2010	Yanai et al.	Col 11, lines 33-67
		US-8677941	01-03-2013	Yanai et al.	Col. 11, lines 31-65
		US-20100019802	08-05-2010	Elazari-Volcani et al.	Para. 0135-0139
		US-20130125835	05-23-2013	Sinn et al.	Para. 0037
		US-4417663	11-29-1983	Suzuki	Col. 4, line 54-Col. 5 line 9
		US-6029080	02-22-2000	Reynnels et al.	
		US-6396938	05-28-2002	Tao et al.	Col. 5, line 26-Col. 5 line 9
		US-6512839	01-28-2003	Toelken	Col. 5, lines 9-25
		US-8019125	01-01-2009	Nadreau et al.	Col. 7,line 16-Col. 8 line 21
		US-9179651	03-13-2014	McKay	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]

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Sheet 3 of 3

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Examiner Name	
Attorney Docket Number	374-2

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		GERSHMAN, Y. A simple way to determine the sex of one-day poultry chickens; The Papers of Independent Authors[online] Vol. 28, DNA 2014 [http://wiyra.org/abs/1405.0016 pages	
		GUY, TM et al., Development of Epileptic Activity in Embryos and Newly Hatched Chicks of the Fayoumi Mutant Chicken, Epilepsia, Vol. 36, No. 1,	

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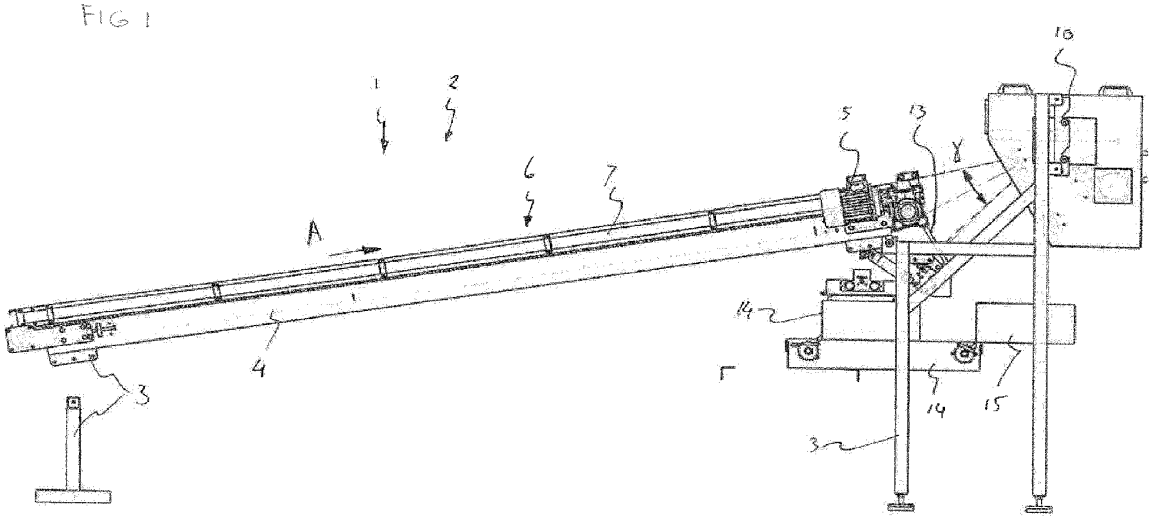
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(54) Chick counter and method for counting chicks

(57) Chick counter device and method. The counter comprises a camera, a chick supply line passing the scope of the camera, and a data processing unit communicating with the camera and programmed to process images captured by the camera to identify and count individual chicks by comparing a plurality of subsequently captured images. The data processing unit can, e.g., be programmed to count individual chicks passing a virtual line at the lower end of the camera scope in an image captured by the camera. Subsequently it compares the image with one or more earlier captured images to trace back the path of the individualized chicks. The number of counted chicks is corrected if a chick counted for one in step a appears to be countable for two or more chicks in at least one earlier captured image. The camera can e.g. be a videocamera.

FIG 1



EP 2 579 188 A1

Description

[0001] The present invention relates to an apparatus and a method for counting and boxing chicks and optionally analyzing and/or selecting chicks.

[0002] NL 8302230 discloses a chick counter. Chicks are successively passed over a conveyor belt through a light beam. The shadow areas formed by the chicks are detected by a detector and the detection signals produced thereby are applied to an object counter. On basis of measurements of the height and the width of a shadow area it is determined whether this shadow area corresponds to a single chick or to a plurality of chicks.

[0003] It has been found that such chick counters are not very accurate, since the chicks tend to sit very close to each other. Therefore, to improve accurateness, the chicks need to be individualized before they can be counted. Individualization and counting needs to be done with very high processing speeds. This results in stress with the chicks and possible injuries. Moreover, the processing speed with such systems is typically limited to about 30.000 chicks per hour per lane.

[0004] In a further step, the quality and the sex of the chicks needs to be checked. An automated system for checking the sex of chicks is for instance disclosed in EP 1 092 347. In this prior art system, chicks are individualized to be photographed one by one. Each chick is induced to lose its equilibrium to make it spread its wings. The feathers pattern at the wing tips constitutes a sex-distinguishable characteristic among chicks. When the wings are spread the wing feather pattern can be photographed using a digital camera. By applying appropriate image processing to the photograph the sex of the chick can be identified from the processed photograph of the wing feathers. In this prior art system the chicks are also weighed.

[0005] It is an object of the invention to provide a chick counting device and method more accurately counting chicks, while creating less stress with the chicks. It is a further object to enhance process speed to count more chicks per hour.

[0006] The object of the invention is achieved with a chick counter comprising at least one camera, a chick supply line passing the scope of the camera, and a data processing unit communicating with the camera and programmed to process images captured by the camera to identify and count individual chicks by comparing a plurality of subsequently captured images. The chicks identified by the data processing unit can be counted, e.g., when they leave the scope of the camera. For accurate counting, the data processing unit can be programmed to:

a. count individual chicks passing a virtual line at the lower end of the camera scope in an image captured by the camera;

b. subsequently compare the image with one or more earlier captured images to trace back the path of the individualized chicks;

c. correct the number of counted chicks if a chick counted for one in step a appears to be countable for two or more chicks in at least one earlier captured image.

[0007] The camera can for example be configured to output about at least 20, e.g., about at least 40 or at least 70 images per second. The camera can for instance be a digital movie camera. The camera may for example comprise one or more CCD's and/or CMOS sensors. The camera may be a colour camera, a black and white camera, a stereo camera or a camera suitable for recordal of UV and/or IR wave lengths. Optionally, two or more camera's can be used, for instance counting the chicks from different viewing angles. Optionally, filters can be used, e.g., for enhancing contrast.

[0008] Optionally, the camera is directed to an end of the chick supply line arranged at a distance above a box positioner for positioning transporting boxes for receiving chicks. At least a part of the distance between the supply line end and the box positioner should be within the scope of the camera to capture images of falling chicks, which show the chicks with relatively large differences in moving speeds and directions. This allows improved individualization of the chicks by comparing subsequent images by pattern recognition software by tracking chicks during their fall.

[0009] Optionally, the chick counter comprises a guiding system responsive to the data processing unit for dosing a desired number of chicks to passing boxes. For instance, the data process unit can be programmed to box a given number of chicks into a box. After boxing the desired number of chicks a new box can be supplied, e.g., via a conveyor, or the guiding system can be redirected towards a new box.

[0010] The guiding system can for instance comprise guiding plates or air blowers or blasters with a controllable blowing angle to forward each chick in the desired direction.

[0011] Optionally, male chicks can be boxed into different containers than female chicks and/or unhealthy chicks can be isolated from healthier ones.

[0012] If an upstream part of the chick supply line is within the scope of the camera, the camera can also monitor the number of chicks approaching the end of the supply line. This makes it possible for instance to vary the transport speed of the supply line in dependence of the number of approaching chicks, e.g., accelerating the supply line if no or only a few chicks are approaching.

[0013] The data processing unit may further be programmed to determine other chick parameters such as volume, weight, colour, shape, sex, reflex, leg length, nostrils, beak quality and/or heel quality.

[0014] Volume can for instance be calculated by determining in the subsequent images the average length of the outline of a chick reduced with the outline of the wings or other less voluminous parts.

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[0015] Weight can be estimated on basis of the determined volume and/or on basis of one or more other correlating parameters.

[0016] Colour can be tested by comparing captures R,G,B values with standard values. Colour is indicative for the health of the chicks. First class chicks have a brighter colour than second class chicks.

[0017] Also the leg length of the chicks is indicative for the chicks health. By measuring this parameter more useful information is obtained about the quality of the chick.

[0018] Heels can be recognized by the data processing unit by comparison with a pre-stored standard heel pattern. If the detected heels are too red, the chick is considered not to be healthy and is selected as not being first class. Similarly, beaks of first class chicks must be clean with open nostrils.

[0019] Reflex can be tested by unbalancing the chicks, for instance when they fall down from the outer edge of an upper conveyor. By reflex movement healthy chicks will spread their wings. The data processing unit can recognize this by comparing the shape of individualized chicks on subsequent images.

[0020] Optionally, the data processing unit operatively communicates with a chick sorter. Chicks without a proper reflex, with the wrong colour or shape or with deviant beaks or heels can be boxed into different containers than the healthy first class chicks and transported to a destruction unit or otherwise.

[0021] The camera can for instance be directed to an end of the conveyor and a slanting guiding plate in line with the conveyor end. Optionally, the slanting angle of the slanting guiding plate is adjustable by means of a positioner. This way, the guiding plate can selectively guide the chicks to different boxes. The guiding plate can be provided with a relief, such as vertical ribs, to reduce light reflection which may disturb proper imaging of the chicks.

[0022] Alternatively, or additionally, air blowers can be used to direct the chicks during their fall into the boxes.

[0023] The apparatus can be used for chicks of any type of poultry, such as chickens, ducks, turkeys or gooses.

[0024] The invention does not only pertain to the apparatus as such, but also to a process of counting chicks using such an apparatus and to a computer program for counting chicks by comparing subsequently captured digital images. Based on information derived from subsequent images captured by the camera, such computer program may also be programmed for controlling the conveyor speed and/or positioning the guiding plate and/or one or more blowers and/or further guiding elements for positioning individual chicks in a selected box.

[0025] The present invention will be elucidated with reference to the figures wherein:

Figure 1: shows a side view of an exemplary embodiment of a chick counter according to the present invention;

Figure 2: shows in perspective view a detail of the chick counter in Figure 1;

Figure 3: shows in perspective view a further detail of the chick counter in Figure 1.

[0026] Figure 1 shows a chick counter 1 comprising a supply line 2 for supplying chicks to be counted (not shown). The supply line 2 comprises a frame 3 supporting an endless conveyor 4 driven by a motor 5. The sides of upper run 6 of the conveyor 4 are fenced with side walls 7 to prevent chicks from falling from the conveyor 4. The upper run 6 of the conveyor 4 is driven to move in the direction of arrow A in the drawing, which is slightly upward under an angle of about 0 - 40, e.g., about 20 - 30 degrees with the horizontal. At the upper end of the conveyor 4 the frame 3 supports a housing 10. As shown in Figure 2, the housing 10 encases a digital movie camera 11 and a data processing unit 12, shown schematically in dashed lines.

[0027] As shown in more detail in Figure 3, a slanting guiding plate 13 extends from the end of the upper run 6 of the conveyor 4 downwardly under an angle with the vertical. At a distance below the upper end of the upper run 6 below the slanting guiding plate 13 is a box positioner 14 for positioning boxes 15 for the transport of chicks.

[0028] In use, chicks are supplied by the conveyor 4 towards the end of the upper run 6. There, the chicks fall over the edge of the upper run 6. During their fall, the slanting guiding plate 13 guides the chicks towards a box 15 on the box positioner 14, After the box 15 is filled with a desired number of chicks (in practice typically 100, although other numbers can also be used) the box is removed and a new box 15 is placed below the slanting guiding plate 13.

[0029] As shown in Figure 1, the outer end of the upper run 6 and the upper part of the slanting guiding plate 13 are within the scope y of the digital video camera 11.

[0030] The data processing unit 12 communicates with the camera 11. The data processing unit 12 is programmed to process images captured by the camera 11 by comparing a plurality of images of one or more chicks subsequently captured by the camera 11 during passage of one or more chicks. Per second about 50 - 80 images are recorded and compared by the data processing unit 12 with earlier captured images.

[0031] The data processing unit 12 compares each captured image with a stored image of the background, i.e. the image that the camera would capture if no chick would pass the camera scope y. Pixels differing from the correspondingly positioned pixel of the stored background picture are considered to be foreground pixels.

[0032] When the chicks fall from the outer end of the upper run 6 of the conveyor 4 their mutual distance will increase. Each pattern formed by a bundle of foreground pixels with a closed outline is counted by the data processing unit 12 as an individual chick.

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[0033] The data processing unit 12 counts each chick passing a virtual line at the lower end of the camera scope y. Subsequently, the data processing unit 12 compares the captured image with earlier captured images to trace back the path of the individualized chicks. Each pattern on an image corresponds to a pattern at a higher position in an earlier image. In comparison with earlier captured pictures each chick on a captured image will have moved vertically and be slightly tilted. A pattern, in first instance recognized as a single chick, may show sections which may have followed different movements between an earlier and a later captured image. For instance one section may have fallen down more quickly than the other and/or one section may have been tilted in a different direction or under a different angle. If a pattern, counted by the data processing unit 12 as a single individual chick when it passes the virtual line, appears to be countable for two, or even more, chicks in an earlier captured image the counted number of chicks is corrected by the data processing unit. This way, the passing chicks can be very accurately counted. Counting speeds of 72.000 chicks per hour or even more can be achieved.

[0034] For each counted chick, one or more additional data files can be stored by the data processing unit 12. The data files can for instance contain data about texture, colour or shape or other data directly or indirectly indicative of the health or quality of the counted chick.

[0035] The box positioner 14 is configured to present two or more boxes 15 at a time to create the possibility to box selected chicks into a different box than other chicks. A first box 15 may be positioned right below the lower edge of the slanting guiding plate 13, while a second box 15 may be positioned in front of the first box 15. To guide each chick to the selected box, the frame 3 holds a blowing unit 18 along the width of the lower edge of the slanting guiding plate 13. The blowing unit 18 comprises a front plate 19 with a row of slits 20. The blowing unit 18 is operatively connected to a source of pressurized air (not shown) and can be actuated under the control of the data processing unit 12. A chick that needs to be boxed into the box right below the slanting guiding plate 13, is allowed to fall down straight into the box 15. A chick that needs to be boxed into the box 15 in front of the first box, can be blown into the box by an air blast from the blowing unit 18. Optionally, the blowing unit may be tiltable into two or more positions to direct the chicks with improved accuracy.

[0036] This enables separate boxing of, for example, male chicks and female chicks or first class chicks and second class chicks on basis of the data detected by the camera 11.

[0037] In an alternative embodiment, the slanting angle of the slanting guiding plate 13 can be adjusted by one or more pneumatic cylinders under the control of the data processing unit 12. If a box 15 is almost filled and the camera 11 detects the a large bunch of approaching chicks upstream the end of the upper run, the data processing unit 12 can adjust the slanting angle of the guiding plate 13 to guide the bunch of chicks into a next, empty box 15. Subsequently, when a smaller number of chicks arrives, the guiding plate can be moved back into its original position to complete filling of the first box.

Claims

1. Chick counter comprising at least one camera, a chick supply line passing the scope of the camera, and a data processing unit communicating with the camera and programmed to process images captured by the camera to identify and count individual chicks by comparing a plurality of subsequently captured images.

2. Chick counter according to claim 1 wherein the data processing unit is programmed to

   a. count individual chicks passing a virtual line at the lower end of the camera scope in an image captured by the camera;
   b. subsequently compare the image with one or more earlier captured images to trace back the path of the individualized chicks;
   c. correct the number of counted chicks if a chick counted for one in step a appears to be countable for two or more chicks in at least one earlier captured image.

3. Chick counter according to claim 1 or 2 wherein the camera is configured to output at least 40 images per second.

4. Chick counter according to claim 1, 2 or 3 wherein the camera is a digital movie camera.

5. Chick counter according to any one of the preceding claims wherein the camera is directed to an end of the supply line, which end is arranged above a box positioner for boxes for receiving chicks, wherein at least a part of the distance between the supply line end and the box positioner is within the scope of the camera.

6. Chick counter according to claim 5 comprising a guiding system responsive to the data processing unit for dosing a desired number of chicks to each passing box.

7. Chick counter according to claim 6 wherein at least a part of the supply line upstream the supply line end is within the scope of the camera and the data processing unit is programmed to select a box for an observed chick on basis of a number of chicks upstream.

8. Chick counter according to any one of claims 4 - 7

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wherein a slanting guiding plate defines a sliding path for the chicks from the conveyor end to the box positioner, wherein the guiding plate is at least partly within the scope of the camera.

9. Chick counter according to claim 8 wherein the slanting angle of the slanting guiding plate is adjustable.

10. Chick counter according to any one of the preceding claims wherein the camera comprises one or more CCDs and/or CMOS sensors.

11. Chick counter according to any one of the preceding claims wherein the parameters produced by the data processing unit include volume, weight, colour, shape, sex, reflex, navel quality, beak quality and/or heel quality.

12. Chick counter according to any one of the preceding claims wherein the data processing unit operatively communicates with a chick sorter.

13. Method for counting chicks by comparing subsequently captured digital images of a plurality of chicks.

14. Method according to claim 13 wherein chicks are counted during their fall from an or a chick supply line, the method comprising the steps of:

a. counting chicks passing a virtual line at the lower end of the camera scope in an image captured by the camera;
b. subsequently comparing the image with one or more earlier captured images to trace back the path of the individualized chicks;
c. correct the number of counted chicks if a chick counted for one in step a appears to be countable for two or more chicks in at least one earlier captured image.

15. Computer program for counting chicks by a method according to claim 13 or 14.

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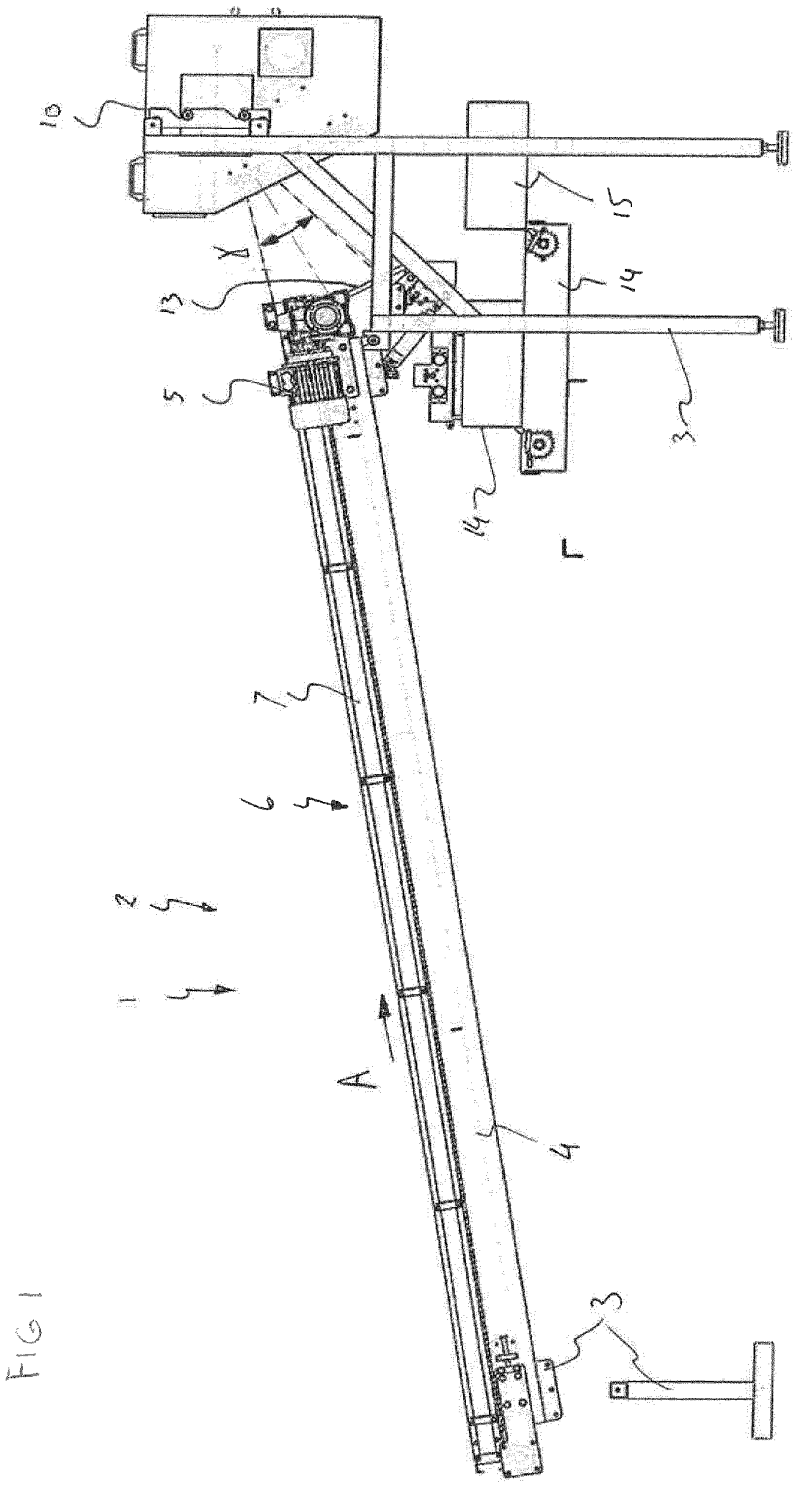


FIG 1

FIG. 2

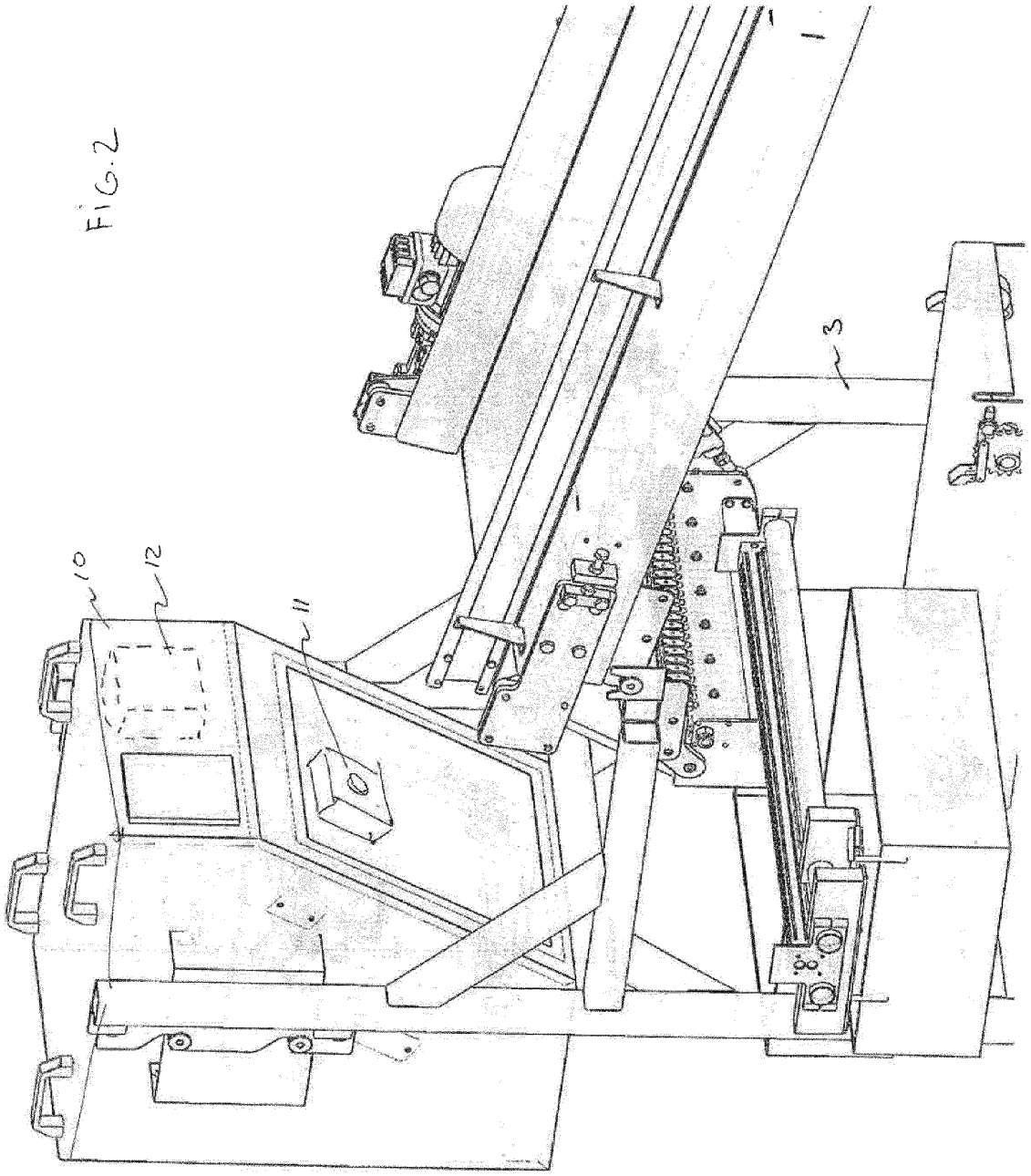
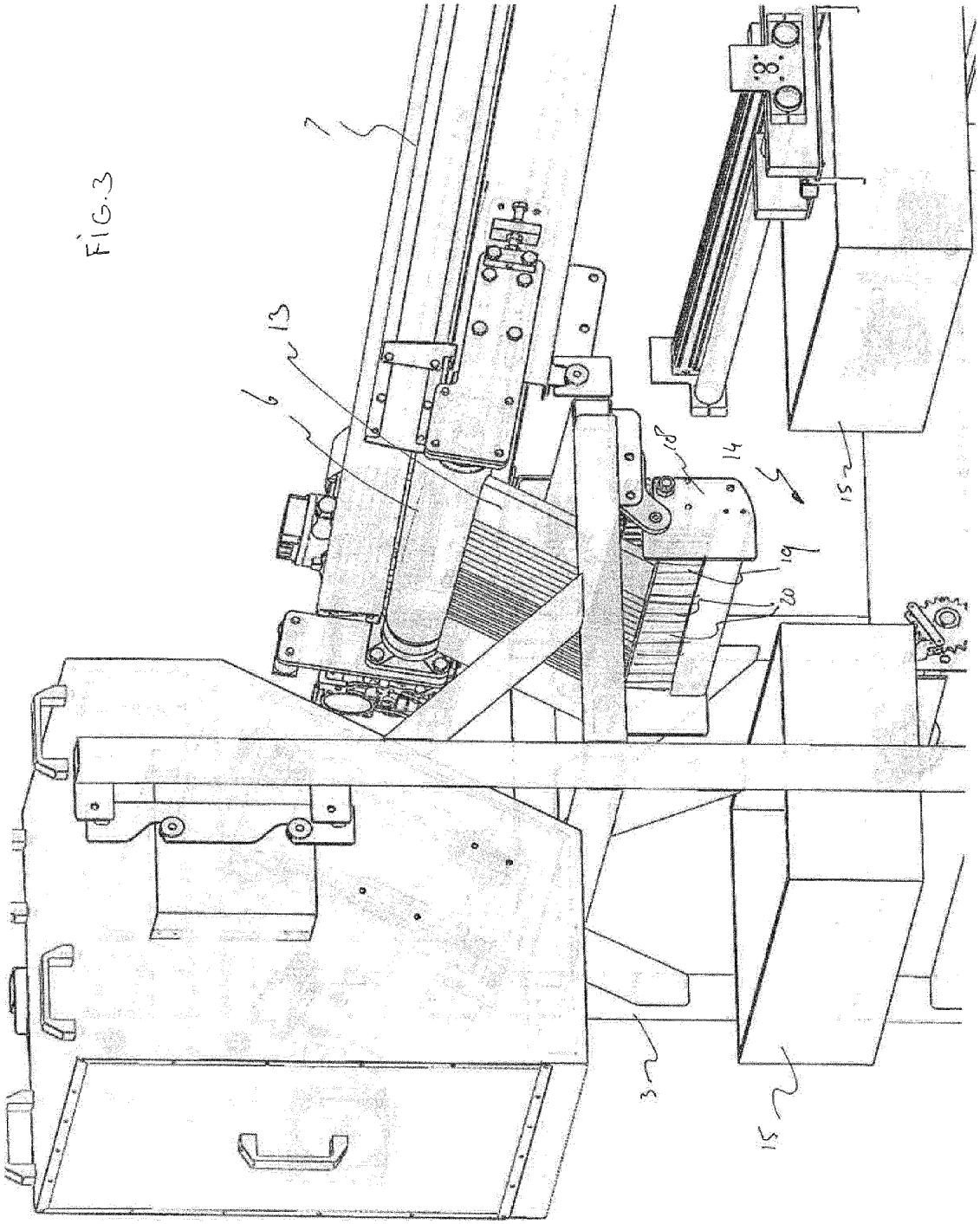


FIG.3



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EUROPEAN SEARCH REPORT

Application Number
EP 11 18 4182

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	FR 2 827 476 A1 (ESOX [FR]) 24 January 2003 (2003-01-24) * the whole document *	1-15	INV. G06M1/10 G06M7/00 A01K45/00
Y	US 2010/124357 A1 (HAMPAPUR ARUN [US] ET AL) 20 May 2010 (2010-05-20) * the whole document *	1-15	
A	WO 2010/087707 A1 (NEDAP NV [NL]; VAN DIJK JEROEN MARTIN [NL]; SCHREURS BERNARD JAN GERRI) 5 August 2010 (2010-08-05) * claims *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

A01K
G06T
G06K
G06M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 February 2012	Gélébart, Yves

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
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T : theory or principle underlying the invention
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EPO FORM 1503 03.82 (P04C01)

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 18 4182

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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29-02-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2827476 A1	24-01-2003	NONE	
US 2010124357 A1	20-05-2010	NONE	
WO 2010087707 A1	05-08-2010	EP 2391985 A1	07-12-2011
		US 2012020517 A1	26-01-2012
		WO 2010087707 A1	05-08-2010

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- NL 8302230 **[0002]**
- EP 1092347 A **[0004]**

Exhibit 1002 (page 279)

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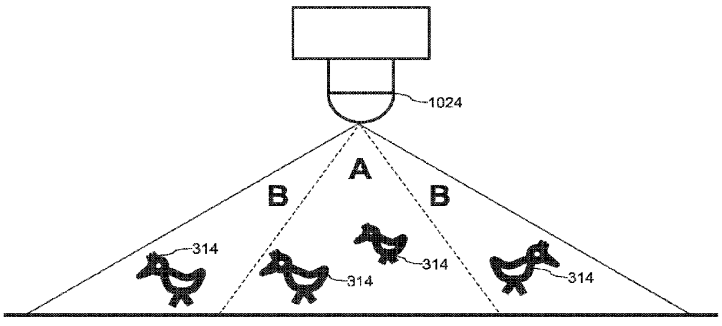
— *of inventorship (Rule 4.17(iv))*

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(54) **Title**: EARLY WARNING SYSTEM AND/OR OPTICAL MONITORING OF LIVESTOCK INCLUDING POULTRY

FIG. 10



(57) **Abstract**: A system and method for early prediction of and/or early detection of conditions affecting a livestock population and/or to monitor a state of livestock may include tracking behavior of previously identified sentinel individuals from a sample of the livestock in which some individuals cannot be directly distinguished. Optionally the tracking may be by means of an optical sensor. In some embodiments an unidentified sentinel may be tracked and/or an unidentified sentinel may be re-identified and/or sentinels may be marked. In some embodiments a behavior may be monitored in the population and a condition of the population may be detected based on a pattern of changes in the behavior. Optionally, the behavior may be monitored in individuals and/or a sample and/or a virtual flock. Optionally the method may be used for early detection of an outbreak of disease, for improved breeding and/or for development of treatments and/or vaccines.

WO 2014/118788 A2

EARLY WARNING SYSTEM AND/OR OPTICAL MONITORING OF LIVESTOCK INCLUDING POULTRY

RELATED APPLICATION/S

This application claims priority from US Provisional application 61/760,242 filed 4 February 2013.

This application claims priority from US Provisional application 61/770,344 filed 28 February 2013.

The contents of all of the above applications are incorporated by reference as if fully set forth herein.

FIELD AND BACKGROUND OF THE INVENTION

The present invention, in some embodiments thereof, relates to a system and method for early prediction of and/or early detection condition affecting a livestock population and, more particularly, but not exclusively, to a system for early detection, characterization and/or prediction of epidemics, environmental problems, stress and/or another conditions affecting a livestock population based on remote measurements of behavior changes of individuals in the population.

The present invention, in some embodiments thereof, relates to a method and system for monitoring a condition of a livestock group and, more particularly, but not exclusively, to a system for monitoring a group of poultry by optical monitoring of a sample of individual from the group.

U.S. Patent Application Publication No. 2010/0198024 to Elazari-Volcani et al. discloses a vitality sensing electronic system and method for monitoring the health of a livestock group, comprising: a vitality sensing unit attached to a sample of individual sentinels in a group of livestock, the unit configured to measure a plurality of physiological and behavioral parameters indicative of the sentinel's health condition, location means configured to locate each of the individual sentinels and a computing and storage unit communicating with the vitality sensing unit adapted to determine the group's health based on the sample of measured parameters.

U.S. Patent No. 8,297,231 to Yanai et al. discloses a system and method for tracking the health of a group of livestock. In an exemplary embodiment of the invention, the vital signs of a small number of sentinel animals is tracked and used to

assess the existence and/or progress of a disease in the group. In an exemplary embodiment of the invention, the vital signs are assessed using a vitality sensor, for example, an accelerometer which provides signals indicating the type and/or other properties of movements made by the sentinel animals.

U.S. Patent No. 8,066,179 to Araki et al. discloses methods and systems for monitoring a herd of animals. Each of multiple sensors are attached to one of the animals and is in peer-to-peer communication with another of the sensors to define a dynamically network arrangement of sensors. A base station is in communication with at least one of the sensors to access the networked arrangement of sensors. A central system is in communication with the base station and has instructions to monitor a position of the herd with data collected by the sensors.

United States Patent Application 2002/0010390 to Guice et al. discloses a method and system (i.e., an Automated Animal Health Monitoring System—AAHMS) for automated monitoring and early warning of changes in parameters related to the health and status of animals. The system includes implantable wireless "smart tele-sensor" elements that can be implanted within the animal where they measure, and may transmit, temperature and other parameters (e.g., blood oxygen, accelerations, vibrations, heart rate) related to the health and status of the animal being monitored. Optional relay elements may comprise simple transponders to boost the signals from the smart sensor elements and retransmit processed results. The system includes devices for alerting personnel responsible for care of the animals and identifying the animal needing attention. Installation tools include optional capabilities to program the smart sensor elements to adapt to animal type, season, diet, or other user needs, and to read and correlate electronic and machine read data with human readable animal identification (e.g., ear or collar tags).

European Patent Application No. EP1212939 discloses a farm management system of a farm for monitoring animals. The system is provided with a computer with an input for supplying the identity of at least one animal. The farm management system is further provided with a plurality of video cameras which are connected with the computer for transmitting image signals to the computer. The cameras are arranged such that at least one animal can be observed at any position of a predetermined area of the farm where the at least one animal can go by at least one camera of the cameras. The

computer is arranged to process the image signals of the cameras in combination for monitoring the at least one animal in the area on the basis of the image of the animal itself, distinctly from any other animals which are located in the area.

U.S. Patent No. 5,983,837 discloses a bird counter capable of separating, detecting, and counting birds. A counterrotating rotor mechanism having flexible fingers receives the birds into a space between the rotors substantially one at a time to separate the birds. The counterrotating rotor mechanism expels the birds from the space substantially one at a time. A fiber optic bird detecting system detects the number of expelled birds after the birds have been separated by the counterrotating rotors.

European Patent Application No. EP1219170 discloses a method for documenting the state of health of farm animals comprising computer-controlled non-invasive evaluation of their appearance, neurophysiological and neuromuscular condition using standard acoustic, optical, mechanical, tactile, neurophysiological or electrical stimulation. The data produced is then stored. An Independent claim is included for device for carrying out the method.

European Patent No. EP0808567 discloses a data-logging apparatus for fitting to an animal, said apparatus comprising sensing means for sensing one or more conditions or activities of the animal, processing means arranged to process output signals from said sensing means and to store data relating to said one or more activities or conditions, and timing means to control the instant of time at which said processing means commences and/or ceases to operate.

European Patent No. EP0624313 discloses a method and apparatus for automatically observing the behavior of animals using at least one automatic identification unit. The identification unit can be mounted at several places in a space where domestic animals are housed, for instance the entrance of the milk parlor, a feeding station or a drinking unit. Thus the number of visits of an animal to a milk parlor, feeding station and drinking unit can be registered. At the same time, it is possible to register the time and the duration of each visit. Behavioral patterns can be recorded. By means of analysis software, deviations in the individual animal-specific pattern can be signaled and pronouncements can be made about deviations in the sphere of animal health and fertility.

Optical flow, flock behaviour and chicken welfare by Dawkins et al. (Hereinafter Dawkins) published in Animal Behaviour 2012 The Association for the Study of Animal Behaviour. Published by Elsevier Ltd. doi:10.1016/j.anbehav.2012.04.036 teaches with respect to chickens that due to a lack of "the ability to sift and analyse the vast quantities of data that can now be collected, the information revolution that the new technology promises is incomplete". Particularly, Dawkins states that "large numbers of animals (35 000 in each house)," and because chickens are "homogeneous in appearance (making individual tracking computationally very difficult)," and because poultry "could not be visually marked … could not be pit-tagged or fitted with loggers".

Figueiredo, et al. (Hereinafter Figueiredo) Development of Machine Vision Based Poultry Behavior Analysis System Paper Number: 033083, 2003 ASAE Annual International Meeting, Riviera Hotel and Convention Center, Las Vegas, Nevada, USA 27- 30 July 2003 discloses an image analysis system developed to extract bird temperature response and feeding behavior from a commercial poultry setting. The algorithm evaluated flock aggregate behavior rather than track specific birds. Image subtraction and masking was used to separate the birds from the background. Image morphology was used to size filter the birds from the background. Results are presented in the text.

An IMS technique (Integrated Management Systems) has been developed using visual image analysis (VIA) system. The system uses video cameras placed inside the poultry house, and allows the continuous collection of images. By measuring bird area and length, bird body weight and carcass yield may be determined with an accuracy similar to that of conventional tables (Penz-Jr A.M., Figueiredo, A.N. and Bruno, D.G. (2009) Proceedings, Conferência Facta de Ciência e Tecnologia Avícola, 27.). This technique is already used for pigs in Europe, and prediction measures for broilers are still under study because the feathers make the true measure of meat surface area difficult (Green D.M. and Parsons D.J. (2006) Mechanistic Modelling in Pig and Poultry Production (eds R. Gous, T. Morris and C. Fisher), Cab International, 305-321).

Chinese published patent application no. CN101894220 (A)- Livestock/poultry health condition data acquisition system discloses a real-time livestock/poultry health condition data acquisition system, which cons of a visual identification platform, a health information database and a sensor network. The entire system has a pyramid

structure. The sensor network of the system is arranged on the bottom layer of the system, comprises a pedometer node, a multi-angle camera, a sound sensor node and an environment sensor node, and records breeding environment data and the data of livestock/poultry movement quantity, shape and stress voice the health information database is arranged on a middle layer, and stores behavior and body features of the livestock/poultry at different growth periods and the virtual identification platform is arranged on a top layer, and is used for identifying and displaying such as health, sub-health, illness and the like on line according to the breeding environment, and sending system has the advantages of flexible structure, convenient use, capability of well ensuring health growth production benefits and reduction in disease spreading risk.

Additional background art includes Chinese published patent application no. CN1464466 (A)- Animal behavior video analyzing system; International Patent Application Publication No. WO2012154841 (A2)- IMAGE ANALYSIS FOR DETERMINING CHARACTERISTICS OF ANIMAL AND HUMANS; Chinese published patent application no. CN101431596 (A)- Dead chicken detection system and detection method for hennery; International Patent Application Publication No. WO2011120529 (A1)- MODEL FOR CLASSIFYING AN ACTIVITY OF AN ANIMAL; Chinese published patent application no. CN102521400 (A)- Method and system for automatically processing massive data in livestock; and Chinese utility model no. CN202068839 (U)- Intelligent poultry farm management system.

SUMMARY OF THE INVENTION

According to an aspect of some embodiments of the present invention there is provided a system for monitoring of a condition of a population of livestock including a plurality of markings for indicating members of a sample of sentinels from the population. Some of the markings may be non-distinctive. One or more optical sensors may be configured for tracking a plurality of individuals from the sentinels over time. A processor may be configured for assessing changes in a behavior of each of the individuals and determining a health state of the individuals based on the changes, and extrapolating to determine a health state of the population.

According to an aspect of some embodiments of the present invention there is provided a system for monitoring of a condition of a population of livestock including a

plurality of markings for indicating members of a sample of sentinels from the population. The system may also include at least one zone wherein the sentinels are not individually identifiable. The system may further include one or more optical sensors configured for tracking a plurality of individuals from the sentinels over time in the zone where sentinels are not individually identifiable. The system may also include a processor. The processor may be configured for assessing changes in a behavior of each of the individuals and determining a health state of the individuals based on the changes, and extrapolating to determine a health state of the population.

According to some embodiments of the invention, the behavior includes at least one item selected from the group consisting of walking, running, flying, drinking, eating, sleeping, preening, standing, sitting, lying and eating.

According to some embodiments of the invention, the changes include a change is at least one measure selected from the group a portion of time involved in the behavior, an average session length for the behavior, an average rest length between sessions of the behavior, and an intensity of the behavior.

According to some embodiments of the invention, the markings include a color that does not disturb the livestock.

According to some embodiments of the invention, the marking include at least one member of the group consisting of an IR color, a narrow band reflector, and a fluorescent marking, a marker distinguishable using a narrow band filter.

According to some embodiments of the invention, the livestock are bred to be optically distinguishable.

According to some embodiments of the invention, the system may further include an orientation mark configured for placement on at least one of the sentinels.

According to some embodiments of the invention, the markings are refreshed.

According to some embodiments of the invention, the refreshing may includes marking a first group, subsequently marking a second group, simultaneously tracking the first and second group, and continuing tracking the second group after a significant portion of the marks on the first group become unrecognizable.

According to some embodiments of the invention, the sensors are further configured to detect a symptom of a disease.

According to some embodiments of the invention, the system may further include a non-optical identifier.

According to some embodiments of the invention, the non-optical identifier may include at least one device selected from the group consisting of an RFID, a coded LED and a radio transmitter.

According to some embodiments of the invention, the system may further include a resolution enhancer.

According to some embodiments of the invention, the optical sensors are configured for the tracking without activation of the resolution enhancer and wherein activation of the resolution enhancer decreases a probability of non-distinguishable sentinels by at least one half.

According to some embodiments of the invention, the resolution enhancer includes at least one device selected from the group consisting of an optical detector having a higher resolution than the optical sensors, a visible spectrum light source, a non-visible spectrum light source, a narrow band light source, and an optical band filter.

According to some embodiments of the invention, the system may further include one or more active beacons configured for mounting on the sentinels.

According to some embodiments of the invention, the processor is further configured to track an unidentified sentinel, storing behavior data in a temporary file and integrate the temporary file with a sentinel file upon recognition of the unidentified sentinel.

According to some embodiments of the invention, the system may further include at least one zone wherein the individual can be individually identified.

According to some embodiments of the invention, the processor is further configured to track an unidentified sentinel, storing behavior data in a temporary file and integrate the temporary file with a sentinel file upon recognition of the unidentified sentinel.

According to an aspect of some embodiments of the present invention there is provided a method for monitoring of a condition of a population of livestock. The method may include marking a sample of sentinels from the population; tracking a behavior of a plurality of individuals from the sentinels over time; assessing changes in

the behaviors; detecting a health state of the individuals, and tracking a previously identified individual when the individual cannot be directly identified.

According to some embodiments of the invention, the tracking includes tracking by means of an optical sensor.

According to some embodiments of the invention, the method may further include extrapolating the health state of the individuals to determine a health state of the population.

According to some embodiments of the invention, the method may further include refreshing the markings.

According to some embodiments of the invention, the method may further include re-identifying a lost sentinel.

According to an aspect of some embodiments of the present invention there is provided a strap for mounting a device to an animal including a long belt; a short belt, and a release mechanism for the short belt. The release mechanism may be configured to release the short belt when the animal grows and the long belt may be configured to hold the device to the animal after the animal has grown.

According to some embodiments of the invention, the strap may further include a further release mechanism for the entire strap.

According to some embodiments of the invention, the release mechanism is by at least one action selected from the group consisting of a remote command, deterioration of the material over time, breaking due to distending as the animal grows, a timed release mechanism.

According to an aspect of some embodiments of the present invention there is provided a system for tracking livestock. The system may include an optical marking that is not visible to the livestock, and an optical sensor for sensing the marking.

According to some embodiments of the invention, the marking includes at least one indicator selected from the group consisting of an IR visible coloring, a fluorescent coloring, an active beacon, a narrow band coloring, a narrow field reflector, and a narrow band reflector.

According to some embodiments of the invention, the sensor includes at least on element selected from the group consisting of an IR sensor, a UV sensor, and a sensor including a band pass filter.

According to some embodiments of the invention, the system may further include a selective illumination source. the selective illumination source may include at least one element is selected from the group consisting of an IR illumination source, a UV illumination source, a narrow band illumination source, a narrow field illumination source, an illumination source including a band pass filter and a short burst illumination source.

According to some embodiments of the invention, the system may further include a processor configured for tracking a sample of the livestock marked with the marking, the tracking limited to maximum number of individuals and determining a status of the sample from data derived by from the tracking.

According to some embodiments of the invention, the processor is further configured for extrapolating to assess a status of a population larger than the maximum number of individuals based on the data derived from tracking the sample of less than the maximum number.

According to an aspect of some embodiments of the present invention there is provided a method of tracking individual animals in a livestock group. The method may include marking the individuals with an optical marking; identifying each the individual; tracking each the individual with an optical sensor; and adjusting the tracking when one or more of the individuals are lost.

According to some embodiments of the invention, the adjusting includes improving the tracking in order to avoid further animals from being lost.

According to some embodiments of the invention, the adjusting includes at least one action selected from the group consisting of searching for the lost individuals by recognizing the marking with an optical enhanced resolution apparatus, search for the lost individuals using a non-optical marking, mark and track a new individual, continue tracking remaining individuals and count the missing individuals as sick and continue tracking remaining individuals, count missing individuals at reduced weight, adjust weighting of remaining animals to account for change in sampled population and count the missing individuals as healthy.

According to some embodiments of the invention, the adjusting includes searching for the lost individuals by recognizing the marking with an optical enhanced resolution apparatus and wherein the recognizing includes at least one element selected

from the group consisting of lighting an active beacon, inducing fluorescence in a fluorescent marking, providing an addition source of visible light, providing an addition source of visible light, providing an addition source of UV light, providing an addition source of IR light, providing an addition source of UV light, making an image with a higher resolution sensor.

According to an aspect of some embodiments of the present invention there is provided a method of tracking individual animals in a livestock group. The method may include marking the individuals with an optical marking; identifying each the individual; tracking each the individual with an optical sensor, and adjusting the tracking when an identity of two or more of the individuals are confused.

According to some embodiments of the invention, the adjusting includes at least one action selected from the group consisting of identifying at least one of the confused individuals by recognizing the marking with the sensor, identifying at least one of the confused individuals by recognizing the marking with an optical enhanced resolution apparatus, identifying at least one of the confused individuals by using a non-optical marking, mark and track a new individual, identifying at least one of the confused individuals by according to a behavior, ascribing to the confused individuals an adjusted behavior, weighting an analysis of the behavior according to an uncertainty of the identity, updating an uncertainty of the identity and continue tracking the confused individuals without counting the confused individuals.

According to some embodiments of the invention, the adjusting includes identifying at least one of the confused individuals by recognizing the marking with an optical enhanced resolution apparatus and wherein the recognizing includes at least one element selected from the group consisting of lighting an active beacon, inducing fluorescence in a fluorescent marking, providing an addition source of visible light, providing an addition source of visible light, providing an addition source of UV light, providing an addition source of IR light, providing an addition source of UV light, making an image with a higher record sensor.

According to some embodiments of the invention, the adjusting includes tracking incompletely identified individuals and weighting interpretation of observations according to an uncertainty of identification and expected behavior of candidate identities.

According to an aspect of some embodiments of the present invention there is provided a method of monitoring a status of livestock. The method may include tracking an individual of the livestock when the individual is not directly identifiable, and detecting a change in a behavior of the individual.

According to some embodiments of the invention, the change is relative to a group of the livestock.

According to some embodiments of the invention, the detecting includes re-identifying a lost individual.

According to some embodiments of the invention, there is a location where the individual is directly identifiable in one location and not directly identifiable in another location.

According to some embodiments of the invention, the detecting accounts for an uncertainty in identity of the animal by weighting a significance of the change.

According to some embodiments of the invention, the tracking includes making an optical image and analyzing the image.

According to some embodiments of the invention, the livestock includes at least one animal selected from the group consisting of a sheep, a goat, a chicken, a poultry, a turkey, a duck, a goose, a chicken, a pheasant, and a fish.

According to some embodiments of the invention, the method or system is used for monitoring the health of the population of livestock, evaluate the effectiveness of a health intervention, evaluate side effects of a health intervention, and select breeding stock.

According to an aspect of some embodiments of the present invention there is provided a method of early detection of a condition in a population of livestock including: monitoring over time changes in a behavior within the population, and recognizing in the changes a pattern associated with the upcoming condition.

According to an aspect of some embodiments of the present invention there is provided a system for early detection of a condition in a population of livestock including: a sensor configured for monitoring over time changes in a behavior within the population, and a computing and storage device configured for recognizing a pattern of the changes associated with the upcoming condition.

According to some embodiments of the invention, the computing and storage device includes a memory for storing the pattern.

According to some embodiments of the invention, the monitoring occurs while population is apparently healthy.

According to some embodiments of the invention, the changes do not include clinical symptoms of the condition.

According to some embodiments of the invention, the invention may further include predicting an outbreak of the condition based on the recognizing.

According to some embodiments of the invention, the pattern includes a repetition of the behavior.

According to some embodiments of the invention, the pattern includes spreading of the behavior to different animals.

According to some embodiments of the invention, a time length of the pattern increases over time.

According to some embodiments of the invention, the pattern includes spatial spread of the behavior.

According to some embodiments of the invention, the pattern includes an increasing difference of the behavior from a normal behavior.

According to some embodiments of the invention, the behavior is a measurement of activity.

According to some embodiments of the invention, the measurement is a quantification of movements.

According to some embodiments of the invention, the movements include non-locomotive movements.

According to some embodiments of the invention, the monitoring is of identified individual animals.

According to some embodiments of the invention, the invention may further include computing a ranking of the individual within a sample with regards to the behavior and wherein the detecting includes detecting a change is the ranking.

According to some embodiments of the invention, the individuals make up a sample of the population.

According to some embodiments of the invention, the sample is broken into a plurality of subsamples, and the recognizing is done separately for each subsample.

According to some embodiments of the invention, the sample is less than 20% of the population.

According to some embodiments of the invention, the invention may further include monitoring a spatial location of the behaviors and wherein the recognizing is further dependent on the location.

According to some embodiments of the invention, the livestock includes at least one animal selected from the group consisting of sheep, goats, fish in a fishpond, and poultry in a poultry house, fish in a fishpond, sheep and goats.

According to some embodiments of the invention, the condition includes a disease outbreak.

According to some embodiments of the invention, the condition includes a stress.

According to some embodiments of the invention, the condition includes an interface problem.

According to some embodiments of the invention, the behavior includes an aberration from a normal behavior.

According to some embodiments of the invention, the condition includes an environmental condition.

According to some embodiments of the invention, the pattern includes rising and subsiding of a prevalence of the behavior.

According to some embodiments of the invention, the invention may further include analyzing the changes for the presence of the pattern.

According to some embodiments of the invention, the invention may further include alerting a caretaker of the state in real time.

According to some embodiments of the invention, the pattern includes a reoccurring behavior.

According to an aspect of some embodiments of the present invention there is provided a method of estimating vitality of a flock of livestock including: observing movements, including movements while the animal remains in one place, of each of a plurality of individuals in the flock; quantifying the movements; characterizing a

respective vitality of each of the individuals from the energy output, and extrapolating from the respective vitality characterizations to estimate the vitality of the flock.

According to an aspect of some embodiments of the present invention there is provided a system for estimating vitality of a flock of livestock including: a sensor configured for observing movements, including movements while the animal remains in one place, of each of a plurality of individuals in the flock , and a computing and storage device configured for quantifying the movements; characterizing a respective vitality of each of the individuals from the energy output, and extrapolating from the respective vitality characterizations to estimate the vitality of the flock.

According to some embodiments of the invention, the quantifying includes estimating an energy expended.

According to some embodiments of the invention, the estimating accounts for a state of the animal.

According to some embodiments of the invention, the state includes at least one status selected from the group consisting of a location with respect to a feeder, a location with respect to a water source, walking, sleeping, a time of day, an environmental condition, a status of the plurality of individuals, and a status of the flock.

According to some embodiments of the invention, the invention may further include mounting a respective accelerometer on the each individual, and wherein the observing includes summing movements measured by the respective accelerometer.

According to some embodiments of the invention, the invention may further include monitoring a second behavior and wherein the characterizing is further based on the monitoring.

According to some embodiments of the invention, the invention may further include tracking a second behavior and wherein the characterizing is further based on the tracking.

According to an aspect of some embodiments of the present invention there is provided a method of estimating vitality of a flock of livestock including: delineate a virtual flock that is a subset of the flock; characterize a health state of the virtual flock; and extrapolate to the flock.

According to an aspect of some embodiments of the present invention there is provided a system for estimating vitality of a flock of livestock including: markings to

delineate a virtual flock that is a subset of the flock, and a computing and storage unit configured for: characterizing a health state of the virtual flock and extrapolating to the flock.

According to some embodiments of the invention, the invention may further include identifying a vitality of the each individual in the virtual flock and wherein the characterizing is a result of the identifying.

According to some embodiments of the invention, the invention may further include alerting a caretaker of a condition, and wherein the alerting further includes informing the caretaker of at least one secondary aspect of the alert, the secondary aspect including at least one attribute selected from the list included of a certainty level of the alert, an acuteness level of the alert, and a potential severity level of the alert.

According to an aspect of some embodiments of the present invention there is provided a method of estimating vitality of a flock of livestock including: monitoring a characteristic of each of a group of individuals from the flock; measuring a rate of change of each of the individuals with regard to the characteristic wherein the change is at least partially balanced off within the overall population, and identifying a transmission of a pathology within the flock from a result of the measuring.

According to some embodiments of the invention, the vitality is used to select an animal for breeding.

According to some embodiments of the invention, the vitality is used for evaluating a health intervention.

According to some embodiments of the invention, the vitality is used for comparing at least two groups of animals.

According to some embodiments of the invention, the vitality is used for evaluating an environmental condition.

According to an aspect of some embodiments of the present invention there is provided a method of estimating vitality of a flock of livestock including: identifying a current state of each individual of a plurality of individuals making up a portion of the flock; recording an observation of a respective individual of the individuals according to his current state; characterizing a respective vitality of the respective individual according to the activity state and the recorded observation, and extrapolating the health state of the plurality of individuals to estimate the vitality of the flock.

According to an aspect of some embodiments of the present invention there is provided a system for estimating vitality of a flock of livestock including: a sensor configured for identifying a current state of each individual of a plurality of individuals making up a portion of the flock, and a computing and storage unit configured for: recording an observation of a respective individual of the individuals according to his current state; characterizing a respective vitality of the respective individual according to the activity state and the recorded observation, and extrapolating the health state of the plurality of individuals to estimate the vitality of the flock.

According to some embodiments of the invention, the invention may further include identifying a vitality of the each individual from a result of the characterizing.

In some embodiments, the characterizing is based on an accelerometer output.

According to some embodiments of the invention, the invention may further include identifying a vitality of the each individual from a result of the characterizing.

According to some embodiments of the invention, the invention may further include evaluating the effect of a health intervention based on the characterizing.

According to some embodiments of the invention, the invention may further include comparing at least two groups of animals based on the characterizing.

According to some embodiments of the invention, the invention may further include evaluating an environmental condition based on the characterizing.

Unless otherwise defined, all technical and/or scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the invention pertains. Although methods and materials similar or equivalent to those described herein can be used in the practice or testing of embodiments of the invention, exemplary methods and/or materials are described below. In case of conflict, the patent specification, including definitions, will control. In addition, the materials, methods, and examples are illustrative only and are not intended to be necessarily limiting.

Implementation of the method and/or system of embodiments of the invention can involve performing or completing selected tasks manually, automatically, or a combination thereof. Moreover, according to actual instrumentation and equipment of embodiments of the method and/or system of the invention, several selected tasks could be implemented by hardware, by software or by firmware or by a combination thereof using an operating system.

For example, hardware for performing selected tasks according to embodiments of the invention could be implemented as a chip or a circuit. As software, selected tasks according to embodiments of the invention could be implemented as a plurality of software instructions being executed by a computer using any suitable operating system. In an exemplary embodiment of the invention, one or more tasks according to exemplary embodiments of method and/or system as described herein are performed by a data processor, such as a computing platform for executing a plurality of instructions. Optionally, the data processor includes a volatile memory for storing instructions and/or data and/or a non-volatile storage, for example, a magnetic hard-disk and/or removable media, for storing instructions and/or data. Optionally, a network connection is provided as well. A display and/or a user input device such as a keyboard or mouse are optionally provided as well.

BRIEF DESCRIPTION OF THE DRAWINGS

Some embodiments of the invention are herein described, by way of example only, with reference to the accompanying drawings. With specific reference now to the drawings in detail, it is stressed that the particulars shown are by way of example and for purposes of illustrative discussion of embodiments of the invention. In this regard, the description taken with the drawings makes apparent to those skilled in the art how embodiments of the invention may be practiced.

In the drawings:

FIG. 1 is a flow chart of interpretation of observed behavior of a virtual flock in accordance with some embodiments of the current invention;

FIG. 2 is a flowchart illustration of an exemplary embodiment of optical monitoring of poultry in accordance with an embodiment of the present invention;

FIGS. 3A and 3B are images (wide angle and zoom respectively), of an exemplary chicken house having marked and unmarked chickens in accordance with an embodiment of the present invention;

FIG. 3C is a schematic illustration of a few exemplary embodiments of markings on chickens at a food bowl in accordance with an embodiment of the present invention;

FIG. 4 is a schematic illustration of an exemplary embodiment of tracking a chicken in a chicken house in accordance with an embodiment of the present invention;

FIGS. 5A and 5B are views of an exemplary device for mounting a marker on a chicken in accordance with an embodiment of the present invention;

FIGS. 6A, 6B and 6C are views of exemplary devices for mounting a marker on a chicken in accordance with an embodiment of the present invention;

FIG. 7 is a flowchart illustration of an exemplary method of refreshing markings in accordance with an embodiment of the present invention;

FIG. 8 is a flowchart illustrating an exemplary method of adjusting tracking in reaction to losing of sentinel in accordance with an embodiment of the present invention;

FIG. 9 is a flowchart illustrating an exemplary method of adjusting tracking in reaction to confusion in the identity of a least two sentinels in accordance with an embodiment of the present invention;

FIG. 10 is an illustration of exemplary zones of high and low resolution around a wide angle optical sensor in accordance with an embodiment of the present invention;

FIG. 11 is a flow chart illustration of an exemplary method of adjusting for an unidentified sentinel in accordance with an embodiment of the present invention;

FIG. 12 is a schematic illustration of a machine for automatically marking an animal in accordance with an embodiment of the present invention;

FIG. 13 is a flow chart illustrating an exemplary method for detecting a condition of an animal or group in accordance with an embodiment of the present invention;

FIG. 14 is a schematic illustration of an example of tracking a healthy chicken in accordance with an embodiment of the present invention;

FIG. 15 is a schematic illustration of an example of tracking a healthy chicken in accordance with an embodiment of the present invention;

FIGs. 16A-B are schematic illustrations of two exemplary embodiments of behavior changes that may be a precursor to a disease outbreak in accordance with some embodiments of the current invention;

FIG. 17A illustrates an exemplary floor plan of a poultry house in accordance with some embodiments of the current invention;

FIGs. 17B-E show time lapsed schematic views of an exemplary spread of behavior aberrations in the poultry house of Fig. 17A before a disease outbreak in accordance with some embodiments of the current invention;

FIG. 18A illustrates resulting measurements from the example of Fig. 17B-D in accordance with some embodiments of the current invention;

FIG. 18B is a chart illustrating an exemplary embodiment to alerting a caretaker according to the data of FIG 18A in accordance with some embodiments of the current invention;

FIG. 18C is a chart illustrating an exemplary alternative embodiment to alerting a caretaker in accordance with some embodiments of the current invention;

FIG. 19 is an illustration of computations to reducing data to shorten transmissions in accordance with some embodiments of the current invention;

FIG. 20A illustrates an example of acceleration measurements for a chicken while drinking in accordance with some embodiments of the current invention;

FIG. 20B an example of acceleration measurements for a chicken while eating (from 1 sec until 400 seconds) and preening (from 400 sec to 600 sec) in accordance with some embodiments of the current invention;

FIG. 20C illustrates acceleration typical for a chicken while walking in accordance with some embodiments of the current invention;

FIG. 20D illustrates acceleration typical for a chicken while sleeping in accordance with some embodiments of the current invention;

FIG. 21 illustrates an example of changes in activity of a twenty four day old chicken over a day in accordance with some embodiments of the current invention;

FIGs. 22A-B illustrate an example of acceleration measurements (three hour averages) for three healthy chickens and one chicken who becomes sick over a week in accordance with some embodiments of the current invention;

FIG. 23A illustrates the normalized activity level of an example of a chicken that was exposed to a chronic illness at age of approximately 28 days in accordance with some embodiments of the current invention;

FIG. 23B illustrates where the chicken of Fig. 23 failed each of 23 tests in accordance with some embodiments of the current invention;

FIG. 24A illustrates the normalized activity level of an example of a chicken that was exposed to an acute illness at age of approximately 30 days in accordance with some embodiments of the current invention;

FIG. 24B illustrates where the chicken of Fig. 24A failed each of 23 tests in accordance with some embodiments of the current invention;

FIG. 25A illustrates the normalized activity level of an example of a chicken that was exposed to an acute illness and recovered at age of approximately 30 days in accordance with some embodiments of the current invention;

FIG. 25B illustrates where the chicken of Fig. 25A failed each of 23 tests in accordance with some embodiments of the current invention;

FIG. 26 is a graph of an experimental example of the number of new chickens failing a vitality criterion over time at the beginning of a disease outbreak in accordance with some embodiments of the current invention;

FIG. 27A is a graph of an experimental example of the number tests failed over time at the beginning of a disease outbreak in accordance with some embodiments of the current invention;

FIG. 27B is a graph of an experimental example of the cumulative number of chickens failing a vitality criterion over time at the beginning of a disease outbreak;

FIGs. 28A-C are time lapse graphs showing a change in ranking and/or relative position of an individual chicken over time in accordance with some embodiments of the current invention; and

FIG. 29 is a box diagram of a system of measuring vitality in accordance with some embodiments of the current invention.

DESCRIPTION OF SPECIFIC EMBODIMENTS OF THE INVENTION

In accordance to some embodiments of the invention, a system may monitor behavior of a sample of individual animals and/or interpret behavior to provide early warning of conditions affecting the flock.

The present invention, in some embodiments thereof, relates to a method and system for monitoring a group of poultry by optical monitoring of a sample of individual from the group.

Overview

Optionally, movements of individual animals may be sampled and interpreted to quantify the activity of each individual. Quantifying activity may include, for example, measuring the energy expended by the animal in movements. Quantifying may include,

for example, quantifying the total number of movements and the intensity of the movements. Movements may be measured directly, for example by integrating measurements of an accelerometer and/or movements may be estimated using simplified methodologies. Alternatively or additionally, movements may be tracked and/or measured by optical means and/or by means of location tags, for example RFID tags.

Movements that are tracked, quantified and/or analyzed include, for example, locomotion and/or small scale movements such as preening, rolling, shaking etc.

1. Pre outbreak warning of conditions

In accordance to some embodiments of the invention, a system is provided to alert a caretaker to a condition detected in a portion of a population of livestock and its potential affect on the entire population. Optionally the alert may include an assessment of the probability that the condition significantly will affect the entire population, an assessment of the significance of the potential effect and/or an assessment of the acuteness of the condition and/or the level of contagiousness.

Alerts may be provided before damage or disease is evident to a human observer. For example, the system may warn of an impending disease outbreak before there is a significant increase in mortality (for example before mortality reaches one per thousand). For example, the system may warn of an impending disease break when even a small portion of the flock (for example less than between 1% and 5% of the flock) has been visibly affected. For example the system may provide a quantitative assessment of the affect of a condition on the group of livestock. For example, the system may quantify how many animals have been affected beyond a certain threshold (for example what portion of a flock has become sick and/or inactive). The assessment may, for example, be based on changes in normal behavior. Optionally the system may recognize a pre-curser of a condition before there are clinical symptoms of the condition. In some embodiments the assessment of a condition of the group is based on movement data and/or a quantification of activity. The assessment may be based on movement data measured and/or tracked using an optical sensor.

In some embodiments, subclinical aberration in behavior that spreads in the populations may be a sign of a developing condition and set off an alert. For example, a transient reduction in activity that occurs in one or more animals and then reoccurs in other animals may be a sign of a developing epidemic. Alternatively or additionally,

reoccurring events increase in significance. For example, reoccurring events may have increasing time length (for example for individuals affected and/or for the group of affected animals as a whole) and/or increase in the number of animals affected and/or increase in the seriousness of the symptoms. Optionally, an aberration that sets off an alert may be apparent at a global, local or individual level.

For example on a global level, a transient decrease in activity may be measured as a decrease in noise level in a bee hive and or a poultry house for a few hours and/or days. On a local level, a transient decrease in activity may be measured as a decrease in noise level in a certain area of a poultry house for a few hours and/or days. For example, on an individual level a transient decrease in activity may be measured as a transient decrease in movements of a few individual animals for a few hours and/or days. Alternatively or additional signs that an aberration in behavior is spreading and/or increasing (for example to more animals and/or to a new area of a poultry house) may set off an alert. In the description herein some embodiments are in terms of a specific type animal. It is understood that the description is not limited to that particular kind of animal. For example, each example should be considered as applicable optionally to poultry including for example chickens, ducks, geese, turkeys and/or cattle and/or sheep and/or goats and/or fish and/or bees and/or other livestock *mutatis mutandis*.

In some embodiments, early detection may be used for conditions that don't result in death or/and are not disease events. For example, some diseases may have reduced production (for instance growth rate of broilers or egg laying rate of layers) but not produce obvious health changes (for example significant deaths and/or clinical signs of a disease). Examples of such conditions may include Mycoplasma infections, some forms of coccidiosis, mild heat and/or cold stress. Early detection and/or treatment of such conditions may increase productivity.

2. Activity - energy expended

In accordance to some embodiments of the invention, aberrations in an animal's behavior may be detected by measuring an animal's activity. Measures of an animal's activity may optionally include tracking how much time the animal spends in certain states. For example, a system may track how much time the animal spends in near a feeding trough and/or a watering trough and/or how much time an animal spends sitting, sleeping, lying down and/or walking and/or eating and/or standing and/or breeding

and/or running and/or bathing and/or preening. Measurements may include the amount of movements and/or the intensity of the movements.

In some embodiments, interpretation of movements may account for a state of the animal and/or the flock at the time of the measurement. For example, the state of the animal may include whether an animal is sleeping or awake, eating, walking, sitting or lying. The state of the animal may include the location of the animal in its pen and/or with relation to food or water sources and/or other animals. Interpretation may optionally take into other conditions such as environmental conditions, location in the poultry house, the age of an animal, the time of year etc.

Interpretation of activity levels may optionally include tracking quantities of behavior, absolute changes in behavior and/or changes in behavior with respect to an expected "normal" behavior and/or a flock averaged behavior and/or historical behavior of the individual. For example, a system may track how far and/or how fast an individual animal and or a group of animals move.

For example, relative changes in behavior within the group and changes in rank and/or relative position may indicate a disease being to spread among the flock before the condition is apparent from flock statistics.

In accordance to some embodiments of the invention, a sample of a large population of animals will be monitor to track a condition of the population. For example, sample of between 100 and 3000 individual animals may be monitored in order to protect a flock. The flock may have for example a population ranging between 10,000 and 100,000 animals. Optionally, given sample size, for example between 250 and 800 animals may be used regardless of the size of the flock. Alternatively or additionally, the sample may be a portion of the flock size for example ranging between 0.1% and 10% of the entire flock. The number of animals sampled may be proportional for example to root of the number of animals for example between the square root and the third root.

Optionally, the sample animals may be individually tracked while the population as a whole may remain anonymous. Optionally, the sample of animals may be treated as a virtual flock and the population statistics may be used to track the condition of the virtual flock and the results extrapolated to the entire population. Results and/or alerts may be available in real time or near real time.

Optionally, data from animals in a restricted geographic area may be interpreted separately. In addition to and/or in place of interpreting general statistics about an entire flock, data may be interpreted locally. For example, a small number of animals behaving suspiciously may not be significant in the entire flock, but if the suspicious animals are concentrated in a particularly area, then this may indicate a significant sign of a problem in that particular area.

In some embodiments behavior may be sampled in time. For example acceleration measurements may be taken at a rate of at a rate between 1 per second to 50 per second in each axis. For example a rate of sampling may be between 5 per second and 30 per second. Measurements may be sampled, for example, reading for a period ranging in length between 1 and 5 seconds and/or less out of a time period ranging for example between 10 and 100 seconds. Results may be averaged over a period of for example between 5 minutes and 6 hours. More particularly, for example, results may be averaged over a period of between 1 minute and 180 minutes. Measurements may be made for the sampling period for example 1 to 24 times a day for each individual animal. Optionally, the sampling rate may vary. For example the sampling rate may be higher during the day than at night and/or sampling may be higher for a more active animal and/or sampling may be increased in certain location, for example near a feed station. Measurements may be collected at a central processor a fixed and/or varying times and/or time intervals. For example, data may be collected at time intervals between one minute and three hours and/or even longer intervals for instance all day. Alternatively or additionally may be collected at a central processor after a certain quantity of movements has been detected and/or after a certain quantity of data has been stored.

For example, for a general characterization of poultry movement it may be enough to sample movements for one second or two seconds or less out of every 10-30 seconds. For example, the same time sampling may be used on all animals in a group to facilitate comparison between animals. Data may be sent to a central processor, for example, once in a period of between 10 and 180 minutes. Alternatively or additionally, data may be sent to the server when a certain number of movements have been measured and/or when a certain quantity of data has been stored. Alternatively or additionally, periodic measurements may be made to determine a qualitative activity state. For

example, a measurement may be for 2 seconds or more once every period of 15 seconds to 5 minutes and the state of the animal during the measuring period may be determined. For example, it may be determined if the animal was walking, resting, breeding, lying on its side, lying on its stomach, lying on its back, rolling, cleaning itself, preening, eating and/or drinking. The measurements may be used, for example, to determine what portion and/or what times of the day the animal spends in what activities. Optionally, some activities may activate an emergency alert. For example if a lot of animals start lying down at an unusual time, an emergency alert may be transmitted warning of a possibility acute heat stroke.

In some embodiments, aberrations in behavior may be detected by measuring an eating habit, crowding in different areas of an enclosure, crowding around water and/or food sources and/or other significant locations, signs of fighting, social changes in flock. For example, there may be a first antenna located near a feeder and configured to receive signals from animals within a range of for example between 1 cm and 100 cm of the feeder.

3. Breeding and/or genetic selection

In accordance to some embodiments of the invention, there is provided a system for remote tracking of behavior of individual animals within a population of livestock. The system provides vitality information for use in genetic selection for growing improved poultry. For example, detailed data may be collected from individual animals. This data may optionally be used to choose and/or breed strains for particular purposes. For example a breed that recovers faster from pre-clinical level disease states may be preferred in a place where poultry diseases are a problem. Behavior under particular stresses, for example during viral outbreaks, may optionally be used to breed animals with higher resistance to particular conditions and/or diseases. Animals having more movement may be bred, for example, to achieve a higher muscle to fat ratio. Animals having less movement may be bred to achieve a higher feed utilization rate. For example, animals may be bred to have stronger upper bodies and/or stronger lower bodies and/or legs. For example, animals with stronger lower bodies and/or legs may be healthier and/or more active during breeding. Optionally, from body movements, birds that are ready and/or prone to laying eggs may be separated from other birds.

Optionally the data may include information about constitution (for example how often an individual or a flock is affected by subclinical disease conditions and/or how quickly they recover). This data may be used, for example, to develop strains with higher resistance to diseases. For example, data may be collected on the rate of development of an animal. For example, a more active animal may develop faster. For example, certain behaviors that indicate developmental state may be tracked. Optionally, such measures may be used to breed an animal that develops faster and/or is ready for market in a shorter time. Optionally, stronger and/or more active animals may be selected and bred. It may be possible to grow stronger animals faster and/or more uniformly than weaker animals (which may for example get sick).

4. Optical tracking of a sample "virtual flock" from a population

An aspect of some embodiments of the current invention includes optical tracking of individuals in a virtual flock taken from a large population. Optionally, changes detected in the individuals may be used to detect and/or predict a present and/or future condition of the virtual flock. For example, the condition of each individual may be determined based on appearance of the animals and/or based on behavior changes with respect to individual history and/or other criteria. For example, epidemiological and/or statistical methodologies may be used detect and/or predict the present and/or future condition of the virtual flock. For example extrapolation may be used to estimate and/or predict the present and/or future condition of the entire group.

Optionally, detailed statistical information about the status of each individual sentinel may give a detailed account of the status of a virtual flock of sentinels. The status of the virtual flock may optionally be monitored and/or extrapolated to estimate the status of entire population. In some embodiments, results of detecting, accounting, tracking, and/or extrapolating his may be available in real time.

In some embodiments, a population of livestock (for example the population of a chicken house may include between 5,000 and 100,000 individuals. Typically, the population of commercial chicken house may include between 9,000 and 60,000 individuals. The house may be packed with, for example, 4 to 25 chickens per square meter of space. In some areas of the house (for example around food dispensers) the crowding may be much greater.

In some embodiments, a virtual flock may include between 100 and 2000 animals. Typically, for example, it may include between 200 and 1000 animals. The virtual flock may be entirely included in a single undivided space and/or the virtual flock may be spread through a few section of a large enclosure.

In some embodiments, each sentinel may be marked. For example, the markings may be not include a distinctive mark for each individual sentinels. Individual sentinels may be tracked constantly for identification.

In some embodiments, a sentinel marking may be orientational. Optionally, an orientation mark may be color coded, for example the head of each sentinel may be marked with one color and the tail with another and/or a mark on the back of each sentinel may be black near the neck and blue near the tail. Alternatively or additional a orientation mark may be geometric, for example an arrow on a chicken's back pointed towards the chicken's neck and/or a circle may be painted on a chicken's head and a triangle on his back.

In some embodiments, a subgroup of the sentinels may be marked with a recognizable mark. For instance, some or all of the sentinels may be marked with a first marking and a sub-group of the sentinels may be marked with an alternative or additional marking. Optionally there may be a multiple identifiable subgroups. Some of the subgroups may include only one chicken.

In some embodiments a large number of distinctive marks may be used on a larger number of animals. For example, although there may not be a distinctive mark for each individual, an individual may be distinguished from most of the other individuals by distinctive markings. For example the identity of sentinels may be preserved through constant tracking. When a confusion occurs between a few sentinels they will generally be re-identified by the distinctive markings. In the rare case wherein the sentinels that become confused have the same markings, the confused sentinels can be, for example, erased from the database and/or tracked without using their previous histories and/or tracked and separated by comparing their current behavior to the known previous behavior of the two sentinels.

In some embodiments, every individual of the virtual flock may be marked with an individually distinctive mark. Each individual sentinels may optionally be recognized in each measurement (for example in each image) from its mark. Alternatively or

additionally, marked sentinels may be tracked. Recognition of individual marks may be used when necessary to identify a sentinel when the tracking has failed to clearly identify one or more sentinels.

In some embodiments a sentinel may be marked with a general marking common to some or all of the sentinels and an individually distinguishable marker for identification. Optionally, the general marking may be of a distinct color differentiating it from the individual markings.

In some embodiments, there may be zones where the sentinels are tracked (for example in less crowded and/or less well lit parts of a chicken house) and zones where sentinels are recognized by their marks (for example in crowded and/or well lit areas for example near food dispensers). If tracking fails and one or more sentinels are lost, the sentinel may optionally be identified when he enters an area where marks are recognized.

5. Markings

In some embodiments a marker may be applied to a chicken. For example a chicken may be painted and/or a portion of the chicken's feathers may be dyed. Alternatively or additionally a marker (for example a color coded tag and/or an electronic tag for example an RFID and/or a location device for example a GPS sensor and/or a coded sensor, for example an LED with a coded signal) may be mounted to and/or implanted into an animal.

In some embodiments, a marker mounted to an animal may be configured to remain on the animal as it grows. For example, a marker tied to a chicken's wings may include an elastic belt. For example, a marker tied to a chickens wing's may include two belts. A tight belt that holds on to a chick and is released as the chicken grows and a loose belt that holds the marker on the adult chicken after the tight belt is released. Alternatively or additionally, a marker may be released from a chicken automatically and/or remotely when it is no longer needed. Optionally a marker may include a beacon to make it easy to find for example when the animal is slaughtered and/or when it falls off the animal. Alternatively or additionally a marker may be removed from an animal by hand.

In some embodiments markers may be renewed over time. For example, a mark may be refreshed for example by repainting or replacing. Refreshing may be automated

and/or manual. Alternatively or additionally a system may be modified to recognize a marker as it changes. For example, a computer may have a learning algorithm that finds new indicators to recognize an animal as a set of markings change (for example as the fade and/or wear off). Alternatively or additionally, as a first sample of sentinel animals become unrecognizable, a second group of animals may be marked. Optionally, the second group may be tracked before a significant number of the first group are unrecognizable. Optionally, background historical data will be collected on the new group before the old group is lost.

In some embodiments, a sentinel may be marked with an optical marking. An optical marking may, optionally, include a color code and/or pattern to identify an animal. Optionally, the pattern may be orientation sensitive. For example, the sentinel may have an orientation marking and an orientation sensitive identification pattern.

In some embodiments an optical marking may be configured to reduce disruption to animal behavior. Optionally, the marker may be invisible and/or minimally visible to the animal marked. For example a bird that is blind to the infrared (IR) spectrum may be marked with an IR marking. Optionally, the optical sensors may include an IR sensor. Alternatively or additionally, a sentinel may be marked with a marker that is not invisible and/or minimally visible under incident lighting. For example an animal may be marked with a fluorescent marking that becomes visible under, for example strong ultra-violet (UV) radiation. Alternately or additionally, an animal may be marked with a color that does not arouse strong behavior aberrations. For example the applicant found that for chickens brown, green or blue may not induce pecking behavior as much as other colors (for example red). Optionally, a filter may be used to make visible marks that are not apparent to the birds themselves. Alternatively or additionally, birds with distinctive natural marking may be used for sentinels. For example, between 100 and 2000 spotted chickens may be introduced as sentinels in a house of 9,000-60,000 chickens. Alternatively or additionally, a breed of animals may be used wherein each animal has distinctive markings and/or wherein 1-5% of the animals have a particular marking distinguishable from the rest of the flock. For example, one may put one or more genes responsible for certain colors at certain locations on a certain percentage of the poultry. One can cause a selected percentage of birds to have a unique appearance from the rest of the band.

6. Tracking

In some embodiments, tracking may time and/or location dependent. For example, in some embodiments, tracking resolution in time and/or space may differ in some locations and/or times and/or dependent a state of the sentinels. For example, at night when many sentinels are sleeping there may be fewer moving sentinels to track. Optionally at night tracking may use a lower frame rate and/or lower light and/or resolution. For example, near a food dispenser animals may be more densely packed then elsewhere. Near the food dispenser the tracking may use higher frame rate and/or higher resolution imaging and/or improved light conditions. For example, a UV light may be placed near the food dispenser exiting fluorescent tags allowing recognition of sentinels under the more crowded conditions. For example, the conditions near a food dispenser may make it possible to distinguish individual markings of a sentinel, while in another area the conditions may prevent distinguishing individual markings. For example, in the other area, identification of an individual sentinel may depend on tracking the individual. Alternatively or additionally tracking may be more or less constant over time and/or homogeneous over space. In some cases a single area may be covered by multiple cameras at different angles. The multiple cameras making multiple images of the same area may help preserve tracking when an animal is obscured from one view. Multiple angle images may make it possible to monitor a three dimensional trajectory of an animal.

7. Monitor condition

In some embodiments of the invention, the activity of a sentinel may be measured. Measures of a sentinel's activity may optionally include tracking how much time the sentinel spends in certain states. For example, a system may track how much time the animal spends in and/or near a feeding trough and/or a watering trough. For example, a system may track how much time an animal spends sitting, sleeping, and/or lying down and/or resting and/or walking and/or eating and/or standing and/or breeding and/or running and/or bathing and/or preening. Measurements may include the amount of movements and/or the intensity of the movements, for example one or more of the speed of locomotion and/or the amount of food eaten and/or water drunk and/or the altitude of flight. Optionally, the system may report to a user what portion of a virtual

flock is in given state and/or status (for example what portion of the flock is healthy, sick, aberrant, normal, sub-normal, above-normal). For example, the reports may be given on-demand and/or at fixed times and/or constantly and/or in real time. The system may optionally measure locomotion and/or non-locomotive movements. Determining an animal's vitality may optionally include quantifying an amount of energy expended on locomotion and/or on non-locomotive movements.

In some embodiments, interpretation of movements may account for a state of an animal and/or the flock at the time of the measurement. For example, the state of the animal may include whether an animal is sleeping or awake, eating, walking, standing sitting or lying. The state of the animal may include the location of the animal in its pen and/or with relation to feeders and/or with relation water sources and/or with relation other animals. Interpretation may optionally take into account other factors such as environmental conditions, location in the chicken house, the age of an animal, the time of year, the time of day etc.

Interpretation of activity levels may optionally include tracking quantities of behavior, absolute changes in behavior and/or changes in behavior with respect to an expected "normal" behavior and/or a flock averaged behavior and/or historical behavior of the individual. For example, a system may track how far and/or how fast an individual animal and or a group of animals may move.

In some embodiments, an optical sensor may be used to detect visual symptoms of a condition of a group of animals. For example, optical sensors may be used to detect blood in stools or on the body of an animal. For example optical sensors may be used to detect un-groomed animals. For example, optical sensors may be used to detect huddling behavior.

In some embodiments, the system or method of the present invention may be used for example for early prediction of epidemics and/or disease break outs and/or other conditions affecting a livestock population.

8. What monitor

In some embodiments of the invention, a monitoring system may provide information for use in genetic selection for growing improved poultry. For example, detailed data may be collected from individual animals. This data may optionally be used to choose and/or breed strains for particular purposes. For example a breed that

recovers faster from pre-clinical level disease states may be preferred in a place where chicken diseases are a problem. Behavior under particular stresses, for example during viral outbreaks, may optionally be used to breed animals with higher resistance to particular conditions and/or diseases. Chickens having more movement may be bred, for example, to achieve a higher muscle to fat ratio. Chickens having less movement may be bred to achieve a higher feed utilization rate. For example, animals with stronger lower bodies and/or legs may be healthier and/or more active during breeding. The system may be used to develop animals with one or more positive attributes for example hardier, healthier, more active, faster growing, bigger, better adapted to crowded conditions, more efficient feed utilization.

A health monitoring system may be used, for example, to estimate the effectiveness of the intervention. For example, this may allow a farmer to change an ineffective intervention. Alternatively or additionally, different interventions may be tried in different sections of the house. The monitoring system may be used for example to determine the most effective intervention. In some embodiments, the system can provide data for quality testing of vaccines. For example, chickens may be vaccinated and then given an illness, the system can be used to measure which vaccine in more effective at preventing side effects and/or minor disruption of health and/or welfare. Alternatively or additionally statistics can be accumulated over time to determine which vaccine is most effective at reducing the disruption of a chicken house due to various diseases. For example, the system can give information to help evaluate of the quality of vaccines and the materials used in them, the qualities of various genetic lines of chickens (for example which are more resistant to disease and/or healthier during breeding). For example, vaccines of different companies may be evaluated to determine which vaccination has fewer side effects and/or which and a vaccine more effective preventing side effects during an infection event.

Detailed embodiments

Before explaining at least one embodiment of the invention in detail, it is to be understood that the invention is not necessarily limited in its application to the details of construction and the arrangement of the components and/or methods set forth in the following description and/or illustrated in the drawings and/or the Examples. The

invention is capable of other embodiments or of being practiced or carried out in various ways.

9. Early prediction and/or detection of an epidemic, stress, disease, environmental deterioration and/or other threats to the population

An aspect of some embodiments of the current invention includes predicting an outbreak of an epidemic and/or diseases and/or stress and/or other health threats in a population of livestock based on observation of behavior. For example, prior to a clinical outbreak, individuals may show subtle behavior aberrations that may optionally serve as an early warning that the population is in danger. Behavior changes may in some cases be due for example to the infection's spreading among carriers and/or due to low level exposure causing subclinical infections. In some cases a low level infection (for example a viral infection) and/or stress (for example low level cold stress) will be followed by a more serious infection (for example a bacterial infection). For example, the earlier infection and/or stress may reduce the resistance of the population. Optionally, the system may be used for early detection and identification of low level stresses and/or infections that may reduce the productivity of livestock.

In some embodiments a target behavior may be monitored over time. Significant and/or reoccurring and/or spreading and/or increasing frequency and/or increasing intensity and/or increasing variety of behavior changes and/or aberrations may trigger a warning of a possible danger to the population. The behavior may be monitored in all in the population in general and/or in a sample of the population and/or in various subgroups of the population.

Referring now to the drawings, Figure 1 illustrates an exemplary method of early detection of an epidemic and/or stress and/or disease outbreak in accordance with some embodiments of the current invention. In some embodiments, a method may start by establishing **102** an expected range for a target behavior. The expected range may optionally be dynamic (for example it may changes as an animal grows and/or be dependent on time of year and/or time of time and/or environmental conditions. The expected range may optionally be defined statistically and/or with respect to other animals in the group and/or outside of the group. Expected behavior may optionally be defined for an individual and/or a group of animals. The range may optionally be established on the basis of data available in the literature and/or by means of

measurements on the healthy population and/or a healthy portion of the population. The expected behavior may change according to history of measurements.

Optionally the baseline may periodically be updated. Alternatively or additionally the range may be comparative for instance a ranking within a group of animals and/or the range may apply to a relationship to a group average and/or variance.

In some embodiments a sample of animals may be selected **103**. The sample may optionally be selected **103** to be representative of the entire group. The sample may optionally include animals mixed throughout the group. The size of the sample may optionally be chosen for example to allow the sample to be treated as a virtual flock and/or to allow meaningful statistic treatment of the sample.

In some embodiments the target behavior may be monitored **104**. Monitoring **104** may optionally be direct and/or indirect (for example food intake may be measured by observing the number of animals located at a feeder and/or by amount of feed supplied). The monitoring may optionally be of an individual. For example, the food intake of each individual may be monitored **104**. The monitoring **104** may be of the group in general. For example, the total food consumption of the population and/or the consumption of food at each of a plurality of feeders may be monitored **104**. Optionally, the strength of individual movements may be monitored **104** and/or the number of movements. Optionally the amount of time spent in one or more states (for example walking, sitting, grooming, eating, drinking, and/or sleeping) may be monitored **104**.

In some embodiments, data measured by a sensor may be processed **105**. For example, data may be processed by a processor at the sensor to reduce storage and/or transmission requirements. Alternatively and/or additionally, data may be processed **105** by a central processor.

In some embodiments data may be transmitted **106**. For example, data may optionally be transmitted **106** from a sensor to a central processing unit. Optionally, raw data may be transmitted **106** to a central processor and/or data may be processed **105** before transmission.

In some embodiments results of monitoring **104** may be stored **107**. Storage **107** may optionally include local storage **107** at a sensor. Storage **107** may optionally include storage **107** by a central processor, for example after transmission **106.**

In some embodiments, monitoring **104** results may be analyzed **108**. Analyzing **108** may optionally be prior to and/or after storing the results. Analysis **108** may optionally include detecting significant changes and/or aberrations **110** in the target behavior. For example as will be described in examples below, detecting changes and/or aberrations **110** may include one or more tests including for example statistical comparisons to past behaviors and/or to stored behavior ranges and/or group behaviors, and/or detecting changes and/or aberrations **110** may include detecting changes in a ranking.

In some embodiments, analyzing **108** data may optionally include recognizing a reoccurring pattern **112** of behavior changes and/or aberrations. For example, a single animal may repeat a behavior pattern and/or a behavior pattern may occur by one animal and then be repeated by another animal and/or a reoccurring behavior patterns may be recognized in an anonymous group. Optionally, aberrations and/or changes that are not individually significant may take significance due to their repetition. Analyzing **108** behavior may optionally include comparing a measured behavior to a threshold. Analyzing may optionally use statistical tools such as means, standard deviations and the like.

In some embodiments, if the system does not recognizes a reoccurring pattern **112** then the system may optionally test for a highly significant **114** aberration. For example, if the single aberration is not of high enough significance **114** then the system may go back to monitoring.

In some embodiments, if the system recognizes a reoccurring pattern **112** and/or there is a highly significant **114** aberration may optionally determine **117** the significance to the entire group of animals. For example, more data may be collected about the occurrence of the behavior in the entire group and/or to determine the cause of the behavior and/or whether it may be endanger a significant portion of the flock. For example, if it is found that there is no increase **115** in the incidence of the aberration in the entire flock and/or there is no significant danger to the entire flock, then the system may optionally return to monitoring **104**. If it is found that there is no increase **115** in the incidence of the aberration in the entire flock and/or there is a danger to the entire flock, the system may optionally send an alert **116** to a flock manager. The system may optionally make further tests **118**. For example, a veterinarian may be called to examine

animals in which aberrations occur. The system may optionally direct the veterinarian to the animal, for example by displaying a map marking of the location of the animal and/or by an active beacon on the animal etc. Alternatively or additionally, the system may move to an alert mode in which monitoring **104** is done more intensively. Alternatively or additionally, the system may turn on further observation systems, for example cameras and/or chemical sensors. Alternatively or additionally, a caretaker and/or a veterinarian and/or an automatic system may start a prophylactic intervention **120**. For example, prophylactic intervention **120** may optionally include for example, drug treatment (e.g. putting an antibiotic into the poultry feed) and/or improving the quantity and/or quality of feed and/or changing the temperature of an enclosure where the group is housed (for example by adjusting a heater, a vent, and/or a fan) and/or cleaning an enclosure where the group is housed and/or extermination of pests and/or slaughtering the part or all of the population early and/or other interventions. Optionally, monitoring **104** and/or further tests **118** may be used to determine the effectiveness **122** of intervention **120**. For example, by measuring subtle changes in individual behavior the effect (or lack thereof) of some antibiotics may be assessed within hours whereas the general effects on the flock may not be apparent to an observer for days. Optionally intervention **120** may be adjusted according the results of monitoring **104** and/or testing **118**. If the intervention is determined to be effective **122** and the problem has been solved, the system may optionally return to monitoring **104** the group.

The effect of heat on livestock may be a function of temperature and humidity, and it may be measured in "heat load units" that take into account the fact that on a humid heat is subjectively harder than a dry heat. A control system (for example for a poultry house) may account for heat and humidity with heat stress or units for convenience effectiveness coop climate control. Behavior may optionally be used to develop a heat humidity control strategy and/or a heat load unit and/or a heat load scale. The scale and/or the control strategy may depend on the type of animal and/or the age. For example chicks may be sensitive to cold. The maximum temperature and/or minimum temperature for chicks may be for example from 1 to 3 degrees Celsius above the temperature that is used for older birds.

For example, in order to avoid heat stress, if for relative humidity between 60% to 70% the livestock enclosure temperature may be set for example between one and

three degrees Celsius below the temperature used for a humidity of 50% to 60%. If the humidity will be between 70% to 80 % then the temperature may be set between for example two and four degrees Celsius below temperature used for a humidity of 50% to 60% then the temperature may be set between one and three degrees Celsius above temperature used for a humidity of 50% to 60%.

The system may control temperature based on measured temperature and/or humidity and/or may use behavioral and / or biological feedback.

Other factors may be taken into account and/or used in tradeoffs. For example, if there is a high ammonia level detected, ventilation may be increased. When the ventilation level is high (for example causing wind chill) the temperature may be set a bit higher and/or the humidity allowed to increase. When heat emissions or behavior indicate heat or cold stress the temperature control system may be adjusted accordingly. Outdoor temperature and/or variations in temperature and/or other conditions around the livestock enclosure may be accounted for. The system may increase the temperature and/or reduce the humidity when a wet floor condition is detected.

10. Method of monitoring livestock

Referring now to the drawings, Figure 2 is a flow chart illustrating an exemplary embodiment **200** of a method for monitoring a livestock group in accordance with some embodiments of the current invention. The method may optionally begin by marking **202** a sample of the group. The sample may include a virtual flock of sentinels. A sample (for example the virtual flock) may optionally be big enough to analyze **208** using statistical and/or epidemiological methodologies. Optionally, the size of a sample may depend on the level of confidence desired in prediction and/or detection. The virtual flock may optionally be representative of the flock. The virtual flock may optionally be small enough to allow efficient and/or detailed observation. The system may optionally be initialized **204** by identifying the sentinels (which may for example be mixed within the larger group). Then observations **205** may be made and recorded **206** for each sentinel and/or for a group of sentinels. The sentinels may be tracked **210** and/or re-identified **211**, and then observed **205** again. Analysis **208** may include, for example, comparisons among the sentinels and/or between groups of sentinels and/or of changes over time within the group and/or a subgroup or within the sentinels and/or a subgroup thereof. In some cases the markings may become less recognizable (for example due to

corruption and/or fading over time, molting, growth of hair and/or feathers etc.). The markings may optionally be refreshed **212**, for example by remarking the same animals and/or by freshly marking new animals and/or by the detection system learning to recognized the sentinels using the signs that remain.

11. Importance of marking a sample

Figs. 3A and 3B illustrate respective wide and close up views of an enhanced contrast image of an exemplary embodiment **300a** of chickens in a chicken house in accordance with some embodiments of the current invention. In a crowded chicken house (having for example 10-30 chickens per square meter and sometimes much more in particular locations, for example in the vicinity of a feeder) it may be difficult or impossible to process and segment the image and/or even to identify and/or track the chickens. The problem may be compounded when conditions are poor, for example the lighting may be weak and/or there may be dust. A chicken coop may contain a very large number of birds (for example between 10,000 to 60,000). Tracking the location and/or behavior and/or status of such a large number of individuals may require excessive computational resources. For example, in a chicken house of 10,000 to 60,000 birds we may mark between 300-3000 sentinels.

An aspect of some embodiments of the present invention is that we select and mark a sample of sentinels from the population that is small enough to allow detailed tracking and/or identification and/or individual analysis. The sample may be large enough to be representing of the entire population using methodologies developed for protecting large populations.

A group of approximately forty birds is illustrated in fig. 3A in accordance with some embodiments of the current invention. Amongst the forty birds there may be for example three marked sentinels **314a-c**. Two feeders **322a,b** are shown in the image. For example, the image of Figs. 3A and 3B was made using a wide angle fisheye lens in accordance with some embodiments of the current invention. Optionally, the lens may allow a single sensor to cover a large area of an enclosure. Using a fisheye lens, images of animals in the center of the field of view and close to the lens may be seen clearly with little distortion. Animals towards the edges of the field of view and far from the lens are may appear distorted and small. For example, for Fig. 3A,B, the sensor was hung over a feeder so that the image of this important zone has a relative high resolution,

while zones towards the edges of the chicken house are visible with more distortion and poorer resolution.

In some embodiments the sentinels may optionally be identified and/or tracked and/or observed in detail. A detailed history may be optionally stored for each and/or groups of the sentinels (for example **314a-c**).

In the example of embodiment **300a** each sentinel **314a-c** is marked with the same marking. Optionally, a marking may include a large easily identified mark **316b-c**. For example on the back of each sentinel **314a-c** in embodiment **300a** there is a large triangle. Optionally, one corner of mark **316b-c** points to the head of each sentinel **314a-c**.

In some embodiments, each sentinel **314a-c** may be marked with an orientation mark. For example the head of each sentinels **318a-c** is marked with an orientation mark **318b-c**. Orientation marks **318b-c** may help discriminate the head of sentinel **314a-c** from the other chickens in the vicinity. Orientation mark **318b-c** may also optionally help to distinguish the direction in which sentinel **314a-c** is facing. Orientation mark **318b-c** may also optionally help to distinguish the activity in which a sentinel **314a-c** is involved. For example, in Fig. 3B, from orientation mark **318b** we can see that sentinel **314b** has his head in a feeder **322b**; he is probably eating. If sentinel's **314b** head were bent back over his back, it may be sign that he is preening and/or sleeping (with his head near his body for warmth).

In some embodiments it may be desired to mark each chicken with an individually identifiable mark. For example, each chicken could be marked with a color code and/or a bar code and/or shape. In such case the burden on tracking may be reduced. For example, if tracking of a sentinel failed, the sentinel may be re-identified based on the markings. In some embodiments, the conditions of the animal house may place constraints on individual markings. For example, there may be a limitation of avoiding certain colors which arouse a pecking behavior. For example, in turkeys, almost any unusual spot with arouse pecking. For example in turkeys markings may be colored with colors that are not visible to the birds, for example IR. For example, certain kinds of markings and/or materials may be avoided due to the danger that they will get into food items if they remain (intentionally or unintentionally) on the animals when they are sent to slaughter. For example the lighting conditions, camera quality and/or

degradation of markings over time etc. may limit the ability to distinguish small symbols. This may, for example, limit the number of distinctive marks that may be used. In some embodiments, orientation sensitive symbols may increase the number of distinctive marks. Optionally, orientation sensitive symbols may be used in conjunction with an orientation mark on the chicken. For example the orientation mark may increase the certainty of orientation when reading the mark.

12. Markings

Fig. 3C illustrates a schematic view of an exemplary embodiment **300b** of chickens at a feeder including some exemplary embodiments of markings in accordance with some embodiments of the current invention. Some embodiments of the current invention may include one or more of the various marking formats illustrated in embodiment **300b**. Some embodiments of the current invention may include one or more animals with the same markings and/or one or more animals with different permutations of the same marking format (for example similar geometry markings with different color combinations). Some embodiments of the current invention may include aspects of different marking systems described herein in combination on the same and/or on different animals.

For example, sentinels **314d** and **314d'** include orientation markings **317a,a'**. Optionally, sentinels **314d** and **314d'** may be distinguished based on characteristics of the chickens themselves and/or by tracking each individual over time.

For example, sentinel **314e** includes a markings **316e** that include color coded (different colors are indicated by different hatching) lines. Optionally, the lines may be of different width and/or the width of lines may be significant in recognition. Optionally, the orientation and/or order of the lines may not be significant. Alternatively or additionally, the orientation and/or order of the lines may be significant. Alternatively, lines may be of similar colors but include different fill patterns (for example hatching, cross hatching).Optionally, colors may include visible colors (for example brown, yellow, blue) and/or colors in other wavelengths (for instance IR dyes and/or UV dyes), and/or a reflective substance and/or a fluorescent substance. In a marking scheme where multiple animals were marked with color coded lines, individual animals may be recognized by the color combination of their respective markings. Optionally, sentinel **314e** may have an additional marking **317b** that is used for tracking. For example,

marking **317b** may be a color that is easily spotted by the tracking sensor. For example, many sentinels may have the same marking **317b**. For example, marking **317b** may be used to facilitate tracking sentinel **314e** when he is in a low resolution area. In the low resolution area, individual markings **316e** may not be easily visible.

For example, sentinel **314f** includes a markings **316f** that include color coded (different colors are indicated by different hatching) lines. Optionally, lines may be of similar width and/or the width of lines may not be significant in recognition. Optionally, the orientation and/or order of the lines may be significant. Alternatively or additionally, the orientation and/or order of the lines may not be significant. Alternatively, lines may be of similar colors but include different fill patterns (for example hatching, cross hatching). Optionally, colors may include visible colors (for example brown, yellow, blue) and/or colors in other wavelengths (for instance IR dyes and/or UV dyes), and/or a reflective substance and/or a fluorescent substance. In a marking scheme where multiple animals were marked with color coded lines, individual animals may be recognized by the color combination of their respective markings.

For example, sentinels **314g** and **314h** are marked with optical markings **316g,h, 317g,h** that include a pattern of shapes. For example the shapes may include squares and a triangle pointing at the chicken's head. Optionally each shape may represents a binary value (for example dark=0, light=1). Alternatively or additionally, a shape may be color coded and/or include a fill pattern. Optionally, shapes may be of similar size and/or the size may not be significant in recognition. Optionally, the orientation and/or order of the shapes may be significant. Alternatively or additionally, the orientation and/or order of the shapes may not be significant. Alternatively or additionally some or all of the markings (for example marking **317d,e**) may serve as orientation markings. For example, 10 shapes (9 squares and a triangle) on sentinel **314h** are each coded with binary color combination. The order of the combinations is significant giving, for example a possibility of $2^{10} = 1024$ combinations. For example, each combination may be used to identify one or more animals. A marker may also optionally include a symbol, for example a letter or a number.

Alternatively or additionally, there may be a non-optical markings **318d,d',f,g,h**. Optionally, the non-optical markings may or may not be visible. Optionally, the non-optical markings may be color coded (for example **318g**). For example some and/or all

of sentinels **314d-h** may have an RFID sensor mounted to their head. For example, feeder **322c** may include eight sections and each section may include a very short range RFID reader that registers the identity of sentinel **314d,e** when he inserts his head into the feeder.

In embodiment **300b** non-optical markings **318d,d',f,g,** can optionally be seen and optionally serve as orientation markings for the optical system. In some embodiments an animal may be marked with more than one system. For example, two marking systems may optionally serve for separate purposes. For example, an RFID system may give accurate tracking of exactly how much time each sentinel spends eating (for example in some embodiments extreme crowding around a feeders and or slow frame rates may make the RFID system more accurate than the optical system for this task). Alternatively or additionally, the RFID system can act as to verify identification made by tracking and/or distinctive optical marks. Alternatively or additionally, non-optical markings may be used to re-identify an animal lost to tracking. For example, if a sentinel has been lost to the optical system, then it may be re-identified the next time it comes to eat at feeder **322c**. Upon re-identification, optical tracking may optionally be restarted. If a bird is lost to tracking and does not show up to a feeder for a long time, this may be a sign that the bird is dead or seriously incapacitated. In some embodiments, an animal may be tracked but its identity may be confused with another animal. The marking system (for example the RFID system and/or distinctive optical markings) may be used to re-identify an animal.

An aspect of some embodiments of the current invention is to use an optical marking that are configured to reduce disruption to animal behavior. Optionally, the marker may be invisible and/or minimally visible to the animal marked. For example a bird that is blind to the infrared (IR) spectrum may optionally be marked with an IR marking. Optionally, the optical sensors may include an IR sensor and or filters that are sensitive at different wavelengths allowing multiple distinctive "colors" in one or more spectrums (for example, IR, visible). Alternately or additionally, an animal may be marked with a visible color that does not arouse strong behavior aberrations. For example the applicant found that for chickens brown, green or blue may not induce pecking behavior as much as other colors (for example red).

In some embodiments, various forms of marking may be used. For example markings may be color coded. Alternatively or additionally, marking may include geometric patterns, for example differing width stripes like a barcode. Optionally markings may be sensitive to orientation (for example three stripes of each taking one of three colors may lead to $3^3 = 27$ distinctive permutations). Alternatively and/or additionally a marking may be orientation insensitive (for example three colors may lead to 3!=6 distinctive combination).

Alternatively or additionally, a sentinel may be marked with a marker that becomes visible under specific conditions. For example a marking may be invisible and/or minimally visible under incident lighting. For example an animal may be marked with a fluorescent marking that becomes visible under, for example strong ultra-violet (UV) radiation. For example a bird may be marked with a reflector that is obvious to a strategically placed light and detector from a particular direction but less obvious casual observation. For example a bird may be marked with a selective dye that absorbs preferentially at a particular wavelength. The dye may, for example, be nearly invisible to the naked eye, but be distinguishable under specific lighting conditions and/or when using a color narrow band filter and/or sensor. In some embodiments, using specific markers and filters or very specific color sensitivity of the camera system may simplify the surveillance system.

In some embodiments, optical markings may be used that are visible under night lighting. For example night lighting may be supplied in the IR spectrum. Optionally sentinels will be tracked at night using IR detectors. Optionally, an animal may have IR mark used at night when there is less traffic and tracking may be simpler and during the day the IR marker may be augmented by visual markings that allow for more positive identification under daytime conditions. Alternatively or additionally lighting can be run continuously or intermittently at night.

Markers may include for example a dye, a mounted device, a sticker, a fabric, a semi passive electro-magnetic device (for example an RFID), an active device (for example a light and/or a transmitter.

In some embodiments, a marker may be semi-active. For example, a fluorescent marker may not interfere with normal activities under incident lighting, but may glow

and allow chicken identification when exposed to strong ultra-violet (UV) light. Reflective colors may increase visibility of an animal in poor lighting conditions.

In some embodiments a marker may include an active element. For example for example LED lights may be mounted on a bird and/or a radio transmitter. An LED may optionally have a distinctive color and/or a color combinations. A LED may optionally flicker in time, for example transmitting any personal code. An active beacon may be activated periodically and/or by remote control to allow re-identification of an animal that has been lost and/or location of a marker that has fallen and/or recognition and removal of a marker when necessary (for example when an animal is slaughtered). Optionally a calculation can be performed based on a flickering marker to determine, for example distance and or speed. An active marker may be activated by certain activities, for example resting over a certain period of time or at a certain hour, drinking, eating.

In some embodiments, a marker may include a combination of the above mentioned elements. For example, a combination of colors may be combined with varying width of lines. For example, an orientation mark may be the same for all animals (for example a purple dot on the tail and/or head) in addition to a distinctive color combination on the back.

In some embodiments an orientation mark may serve on or more of many functions. For example, it may help locate an animal. Optionally, it may help prediction of direction of movement for example to assist tracking. Optionally, it may help orientation for reading a color combination. Optionally, it may help in recognizing certain activities. For example, from the direction of the marker it may be possible to determine if an animal is lying on its side and/or back, stretching its neck and/or preening its feathers, eating and/or just standing near a feeder, walking forward and/or jumping backward etc.

In some embodiments, optical detectors serve for direct observation of signs of health and disease. For example an IR camera may be used to measure heat emission from poultry, for example unusually high or low temperatures may be a sign of a disease. For example visual range cameras may be used to detect blood stains in stools and/or on chickens and or on wall and/or on feeding bowls. Such stains may indicate presence of a disease or a problem of pecking within the house. Observations may optionally be made in multiple bands (for example using narrow bandwidth sensors

and/or filters). Some symptoms and/or markers may be apparent in one band while others in another band.

In some embodiments a house observation system may be used by a human. For example, the system can provide a map of the coop on a mobile device (for example a mobile phone or notebook computer) showing the location of a sick chicken. Alternatively or additionally, a laser pointer may be supplied to point out a sick chicken. Alternatively or additionally the person can point a laser pointed at a bird and the system will tell him when he find the chicken for which he is searching.

In some embodiments a calibration device may be supplied. For example a coop bar can be placed with a number of grades of color and/or temperature (controlled for example the heating element and thermostats). The bar may optionally be placed in coop to serve as a standard table and allows to calibrate visual and/or IR cameras for example under changing environmental conditions (for example dust and/or humidity and/or lighting). The calibration can optionally be adjustable to allow course and/or fine calibration. The bar may be made for example, from aluminum, stainless steel and metal material, polymer, ceramic, and/or painted and/or coated with a particular and so on.

13. System geometry

Fig. 4 illustrates an exemplary embodiment **400** of a portion of a poultry house with a monitoring system and a trajectory **429** of a sentinel in accordance with some embodiments of the current invention. In embodiment **400** the monitoring system includes an optical sensor **424** in communication with a processor **428**. In some areas of the chicken house (for example near feeders **422a,b**) there may be a resolution enhancer. For example the resolution enhancer **426** may include a light source (for example a higher power visual light to improve visual image quality and/or a UV light to activate fluorescent markings) and/or a high resolution camera (for example there may be a wide angle camera tracking animals in large area and a higher resolution camera that allows a more detailed look at interesting details. A grid may be supplied (for example painted on the floor) to make it easy to direct the high resolution camera at a location identified in the wide angle image)) and/or a RFID sensor. In some embodiments, a special band optical sensor may be used. For example a sensor may detect coded LED signals. The sensors may be spread around an enclosure and read timed LED signals and/or a sensor may be located at a specific location with a trigger that activates an LED, for example

when an animal passes by. In some embodiments a wide angle sensor may be used. The image quality may optionally be higher towards the center of the field of view and/or near the camera.

In some embodiments, the monitoring system may for track states of a sentinel and/or its movements at and/or between various points **423a-n** along the trajectory. In the exemplary embodiment **400**, sensor **424** makes an image of the area at the end of a ten second time frame. In each image, sentinel birds are located in the image and for each bird various parameters are computed. For example, it may be computed how far the bird moved since the previous time frame. From the distance moved, a rate of locomotion may be computed. When a bird lies in one place over a few frames the amount of time lying in place may optionally be recorded. Time spent near feeders and water sources may optionally be recorded etc.

In the example of embodiment **400** a sentinel may be tracked, for example, starting at point **423a**. After ten seconds, in the next time frame the sentinel has moved to point **423b**. Point **423b** is near a watering trough **420**. For example, the sentinel may remain near the watering trough for between forty and fifty seconds. In the example, the sentinel will be found around point **423b** in four consecutive time frame images. The system may optionally record the location of the sentinel. The system may optionally check the position of the sentinel's head and/or body and/or the position of other chickens near the watering trough to determine a state of the sentinel. For example, the sentinel may be drinking, and/or waiting for another chicken to move out of the way so that he can drink and/or fighting and/or preening and/or bathing etc.

In the example of Fig. 4, the sentinel continues on trajectory **429** to points **423c,d,e**, showing up at each point **423c,d,e** in only one image. The long distances between points show that the sentinel is walking fast. The general direction of the sentinel is toward feeder **422a**. The speed of motion and/or the tortuosity of the path may optionally be recorded and/or interpreted. The images while the sentinel is walking by point **423c-e** may be examined to for signs of a locomotion problem (for example did the sentinel walk on a convoluted course because the direct path was blocked by other chickens and/or was the sentinel limping etc. For example, a tendency of an animal to walk torturous paths and/or change directions less often than normal and/or less often than other animals may be a sign that the animal is sick and/or becoming sick.

After a few time frames the sentinel comes to point **423f** near feeder **422a**. The sentinel may remain near the feeder approximately in the same point **423f** over five or six 10 second time frames. For example, the sentinel may be recorded in five or six images near point **423f**. During the time that the sentinel is by feeder **422a** the system may monitor, for example the sentinel's activities, whether he is facing the food and/or facing another chicken and/or eating and/or sitting and/or standing and/or locomotion and/or preening etc. Optionally the system may keep track of a sentinel's personal habits. For example the system may track which feeder a sentinel uses. For example, if a sentinel starts using a different feeder this may be a sign of some new condition (of the feeder and/or of the sentinel.

In embodiment **400** there is image enhancer **426** is located near feeder **422a**. For example image enhancer **426** may include an ultra-violet light source. The sentinel may optionally be tagged with a fluorescent tag identifying the particular sentinel. In some embodiments, the resolution may be too poor to identify each individual chicken in most of the chicken house. Once an individual is identified, the system may, for example, try to track individuals also in the low resolution areas. When the individual comes to a high resolution area his identity may be verified and/or corrected (for example if a misidentification and/or confusion had occurred). If the individual identity is lost, he may be re-identified when he comes to a high resolution zone. For example, when the sentinel in the example of fig. 4 comes to point **423f** he may be identified. A high resolution zone may include, for example, a better light source, a higher resolution sensor, a RFID reader etc. Alternatively or additionally high resolution zones may be located where tracking is difficult (for example in crowded regions near feeders etc.) Alternatively or additionally, a sensor may be a high resolution zone, but further away, the sensor may have a limited ability to distinguish markings, for example as illustrated in Fig. 10.

Following eating, the sentinel may, for example wander towards a watering trough **420**. On the way he may pass consecutive time frames at points **423g-i**. Alternatively or additionally the sentinel may stop at some points (for example **423h** for a few frames). While a sentinel remains in a single place over a few frames, the system may, for example, analyze various aspects of the images to determine the animal's status. For example, is he standing or lying down, are his eyes open or closed, which way is he

facing, does he change positions, is he near other animals etc. Optionally the system may track an animal's resting habits (for example does the animal only walk short distances and rest often and/or does he sometimes walk long distance before resting. does the animal move to comfortable areas to rest or does he rest even in crowded areas, does the animal tend to rest in warm spots and/or cold spots), whether the animal stays together with other animals in general, whether the animal is consistently associated with another a particular sentinel etc. The system may also register aspect of the sentinel's appearance such as how he stands and/or sits (does he tend to lean to one side more than the other), does he tend to walk directly forward and/or slightly sideward. In some embodiments, some of these behaviors will not be clear in every image, but over time as a lot of images are processed a pattern and/or tendency may be discernible.

After a few time frames walking and/or resting, the sentinel may for example come to point **423j** near water trough **420** and drink for two time frames and then move to point **423k** to drink for another three time frames. The system may record such details as whether an animal stays in one place while eating and/or drinking or moves. The system may record for example, how much time the animal eats between acts of drinking and/or how long the animal waits after eating before drinking etc.). For example, statistics could be computed on how much time a chicken spends by feeders, how many times a chicken visits the feeders, how much time the chicken spends at the feeder each time he visits, what portion of the time that the chickens spends near the feeder is he actually eating. Such behaviors may optionally be adjusted for example to environmental conditions for example the temperature (for example an animal may be more lethargic, spend more time near water on a hot day). Behaviors optionally may be compared to other sentinels in the virtual flock and/or to flock statistics. For example, if one sentinel doesn't drink it may be a sign that he is sick; if all the sentinels suddenly stop drinking it may be a sign that there is something wrong with the water system.

After drinking, the sentinel may go to an edge of the chicken house, for example from points **423l,m** to point **423n**. The chicken may, for example sleep for a long period at point **423n**. The system may optionally record movements while sleeping (for example rolling) and/or the consistency of sleeping (does the animal sleep for long periods straight and/or does he wake up and back to sleep often).

In some embodiments, an individual sentinel may have individual marking. Optionally, each sentinel may be monitored individually. Each sentinel having an individual mark may help when, for example, tracking of one or more sentinel fails, for example sight of the sentinel is lost. In some cases, sight may be lost of a number of sentinels. For example cloud of dust, and/or a power failure, and/or a light failure and/or a camera failure and/or a need to re-boot the system without losing the information stored on the individual. For example at night there may be a reduced frame rate and/or reduced light, but the birds may be frightened and run away from their place leading to lost tracking of a large number of birds. Having individual marks on sentinels may help the system re-acquire identities of sentinels and/or associated sentinels with their medical history information. For example, when a sentinel has been lost, an image may be scanned and/or a sensor may scan an area to locate the mark associated the lost sentinel. For example, when every sentinel is individually marked there may be no need to track each sentinel all the time. The frame rate may vary as needed for monitoring the condition of the flock. For example, when rapid movement occurs the system can collect frames at high speed, when there is little movement, the system can collect the frames at a slower rate.

In some embodiments, the group of sentinels may include a virtual flock. Optionally the virtual flock may be representative of the entire population. The virtual flock may contain, for example, between 200-1000 individuals. In some embodiments the number may be large or smaller.

In some embodiments, each sentinel may be marked with an individual marking, but each mark may be repeated. Individual sentinels may optionally be monitored. Tracking may optionally be used to preserve the identity of individual sentinels. When a confusion occurs on the identity of some of the sentinels it may optionally be possible to clarify the identities by the markings. In some embodiments, a portion of the sentinels may be lost. In some cases, for example a small population, every animal in the population may be tracked.

In some embodiments, sentinels may include birds having a different natural coloring than the rest of the flock. Optionally, a species may be bread to have a coloring that makes it possible to recognize particular individuals. For example, a breed of chicken may include a tendency for a portion of the birds to have a distinct coloring on a

small part of their body. Optionally animals may be bred to allow marking. For example, birds may be bred to not to peck at markers etc. For example a chicken may be bred wherein between 90 and 99% of the chickens are white and between 1 and 10% of the chickens have an obvious marking somewhere on their body.

In some embodiments, a single mark may be used for all of the sentinels and/or a few marks may be used, each mark being used on a large subflock of sentinels. For example there may be 1 to 20 subflocks. The sentinels may optionally be tracked. Statistics may be kept for the entire virtual flock and/or for each subflock. For example between 2000 to 4000 sentinels may be marked in a population of, for example, between 30,000 to 60,000 animals. Optionally, some individual sentinels will be tracked. In some embodiments, the system may track a condition of some individual sentinels by an idiosyncratic parameter, for example, distance walking, eating, drinking. When sentinels are not individually marked the system may optionally have a minimum frame rate to preserve tracking and/or identity of sentinels. For example, for poultry, the minimum frame rate may be between a frame per second and a frame every twenty second. The minimum frame rate may continue to preserve tracking even when data is not needed to health monitoring.

In some embodiments individual markings may have fine aspects (for example different width stripes) that allow identification of a particular individual and more obvious aspects (like the color of the stripes) that allow for identification of a subgroup and/or separation of two birds even when the picture resolution is low.

In some embodiments different regions may be monitored separately. For example a chicken house may be divided into four regions. Each region may have a separate marking scheme. For example each region may include chickens numbered from one to one hundred. Statistics may be compared between regions. Changes in one region with respect to another may, for example, be a signal of a problem.

In some embodiments detailed tracking of animals may take place in a various sites. Optionally, all or nearly all of the animals in those sites may be monitored. For example, between 50 to 150 sites may be monitored. Each site may have a relatively small area of, for example, between 1 to 10 square meters. The sentinels in this case may optionally be a dynamic sample of the population. The size of the sample may remain more or less fixed while the individuals in the sample may change over time.

In some embodiments methodology of detailed tracking of unmarked birds in a few locations may be used in combination with tracking marked sentinels. Optionally in the locations of detailed tracking, lost sentinels may be identified.

In some embodiments, the population may be tracked statistically. For example, one or a few cameras may monitor all or part of a chicken house (for example between 70 to 100% of the chicken house) and track all or part of the population (for example between 70 to 100% of the population). Alternatively or additionally, each part of the house may have one or more dedicated cameras.

In some embodiments, various parameters may be tracked for a sample of and/or the entire population. For example, the distribution of speeds of movement and the distribution of states (for example standing, sitting, lying, walking, Running, flying, eating, drinking, preening, sleeping) may be monitored. The system may also for example track when an animal "migrates" from one area of an enclosure to another. Optionally, various parameters may be correlated in time and/or according to individual animals. For example, what portion of animals that are near the feeders are eating, lying, standing, preening. For example, what portion of the animals that are lying down are also sleeping. Optionally, different parts of a single poultry house may be compared and/or different poultry houses may be compared. Comparisons may be made historically to populations in the past and/or within a single population over time. The development of the population may optionally be tracked. Changes in behavior statistics over time and/or space may be tracked. Changes over time may be compared to previous poultry houses or contemporary poultry houses. A change in behavior from a previous day may, for example, indicate a malfunction of a heater and/or ventilator and/or water system and/or an external factor, and/or a problem with feed and/or a disease and/or the presence of an intruder.

In some embodiments, an image may be made in each time frame of 10 seconds and/or for example between 2 to 10 seconds and/or every half a minute and/or once a minute. During the time between images, previous images may be analyzed. Statistics may be computed of activities on a for example an hourly basis and/or daily and/or at other intervals. In some embodiments images may be made in groups, for example images may be made once every ten seconds for 20 minutes and them once every second for 30 seconds and then back to one every second. For example the high rate images

may be used to reveal detailed movements of sentinels while the low rate images are used for tracking and static details. The frame rate may change. For example a high frame rate may be used during the day and/or in crowded area of the chicken house.

Optical monitoring may be integrated with other methods. For example accelerometers may be placed on some or all of the sentinels and/or non-sentinel animals and/or food and water consumption may be monitored and/or levels of gases in the air of a poultry house and/or temperature, of one or more animals and/or the environmental temperature etc. may be monitored. For example, one may monitor the time a chicken stands near feeders and the weight gain, for instance this may help recognized and/or differentiate loss of appetite and/or malabsorption of food. This may help recognize for example intestinal parasites and/or chronic conditions, and/or animals that cannot get to food due to social factors (other animals prevent him from reaching the food), such a comparison could also be made for groups of animals. Various optical observations may be integrated. For example, an IR camera may be used to track movements of an animal and also measure the heat emissions of the animal. For example, decreased quantity of movement with increased and/or decreased body temperature may be a sign of an infection. Visual and IR data and/or images may be integrated.

14. Optional indicators that of health condition and/or change in health status

Various activities may be measured to indicate the status of a sentinel and/or the group of sentinels and/or the population of animals. Optionally for any of the parameters describing activities, statistics may be computed, for example average, standard deviation, maximum, minimum etc. For any activity the system may optionally be able to track various parameters such as the cumulative amount of time involved in the activity; the length of each session of the activity, the number of sessions and/or the length of breaks between sessions of the activity. Optionally, for particularly activities there may be particular parameters. For example for locomotion, time, speed and/or tortuosity of path may be tracked. Optionally, activities may be subdivided, for example locomotion may be divided into for example walking, running, flying etc. Optionally comparisons may be made, for example between animals, to the group as a whole and/or a subgroup, over time, at different times (for example morning, afternoon, night), according to location (for example near water, near food, in crowded zones, in non-

crowded zones, in a particular area, eating at a particular feeder) between groups and/or subgroups, to standard values for normal and/or abnormal behaviors. For chickens in a chicken house one could measure, for example:

- locomotion (for example walking, running, flying);
- resting (for example lying on the back, side, stomach and/or standing and/or preening and/or sitting);
- eating;
- drinking;
- urination/defecation;
- abnormal behaviors (for example ticks, spasms, odd walking, walking along a crooked path).

For example for a given behavior, the system may track an individual and/or keep statistics of a group of animals. For a given behavior the system may track statistics describing the behavior, for example an average and/or a standard deviation over time and/or over a group of animals. For a given behavior the system may track for example the portion of time an animal spends in that behavior (for example over an hour period how much time did an animal spend walking) and/or a magnitude of the behavior (for example speed walking, distance walked) and/or the length of the session of the behavior (for example how long does the animal walk before taking a break) and/or the length of breaks between sessions of the behavior (for example how long are the breaks between periods of walking) and/or the number of times that the animal performs the activity and/or a ratio of a measure to another activity (for example the ratio of the time the animal spends walking to the time the animal spends sleeping). There may be a threshold to a measure (for example an act of walking is only counted if the animals walks at least two meters and/or for at least ten seconds etc.). Activities may be classified and/or counted according to where they take place (for example standing near a feeder may be counted separately from standing in an empty area). Behaviors that may be measured include for example walking, flying, eating, drinking, sleeping, sitting, lying, running, preening, standing, being in a particular location, The system may store images and/or statistics of behaviors and/or other data. Some data may be stored erased quickly (for example raw image data may be retained between 10 seconds and and/or

raw behavior statistics may be retained between an hour and ten days and/or processed statistics may be retained permanently and/or erased after a group is slaughtered.

15. Appearance

In some embodiments, the system may optionally track certain symptoms of disease and/or health status directly. For example for a chicken the system may characterize certain states and/or movements, for example walking, cleaning feathers, running, eating, drinking, lounging, open eyes, fully or partially closed eyes. The system may optionally classify some actions as normal and/or abnormal. Optionally certain appearances may be detected and classified for example as normal and/or abnormal and/or pathological. For example, chickens standing still with bristling feathers and/or eyes half-closed or closed and/or birds standing with head tucked down and/or birds have difficulty breathing (for example an open mouth and/or rising and falling tail) and/or movements of breath and tail visible and/or birds walking and limping and/or twitching and/or fluttering. The system may optionally recognize normal and/or abnormal grouping and/or huddling behaviors. The system may optionally recognize normal and/or abnormal and/or pathological colors. For example, the system may recognize when a white chicken becomes dirty brown from diarrhea and/or the system may recognize blood stains blood around the anal area.

In some embodiments, the system may include cameras in different wavelengths covering the same and/or different zones. For example some markings may be apparent in some wavelength and not in others. For example IR sensors may be used to detect heat emission from animals. For example heat emission data may be a useful in tracking the prevalence and acuteness of avian influenza. For example, if high IR radiation levels are detected throughout a chicken house, the system may warn of potential heat stress and/or heat stroke. If the IR signal is unusually weak, the system may optionally issue a warning for cold stress. Based on the IR measurements and/or behavior of the flock, the system may automatically adjust the environmental conditions of an enclosure. For example, if it is seen that chickens are overheated and/or becoming lethargic, the ventilation system may be turned up to cool a chicken house. For example, if it is seen that the animals are too cold and/or are huddling together a heater may be turned up.

In some embodiments, the system may track general movement data of the population and/or a virtual flock of sentinels. Optionally, the system may use general

data to assess the health of the virtual flock and/or population without indentifying and/or tracking individual sentinels. For example, general processes that may be tracked include for example statistics on various processes such as average, standard deviation, maximum minimum, cumulative time, length of uninterrupted actions, and/or portion of the population involved in an action at a particular time etc. General parameters that may be tracked include for example: locomotion (locomotion may be subdivided into different types for example walking, flying, running); population density in different areas for example around feeders, water troughs, sitting areas; resting; sitting, standing; preening; eating; drinking; fighting etc. A user may be able to access historical and or real time data about the population density in any part of an enclosure (for instance a chicken house) and/or preference of the animals (for example food intake). A user may be able to access data from the system, for example the portion of animals displaying a certain behavior, in real time or near real time. Access to the system may be via a dedicated user interface and/or a wireless system and/or over the Internet. For example a farmer standing in the chicken house may be able to communicate with the system and/or get data using a cellular telephone.

In some embodiments, the current invention may track the progress of various stages of a disease outbreak. For example, the system may discern individual history of animals getting sick and the progress of the disease in the population. It may for example, be possible to develop interventions that prevent development of an epidemic by prevent a certain stage of the process and/or a way to recognize an outbreak at an earlier stage.

In some embodiments the current invention may be applied to interpret clinical trials of disease interventions. The system of the current invention may optionally track details of a disease outbreak and/or the effects of an intervention. For example, key sub processes of an outbreak may be identified. Precise effects of an intervention may optionally be tracked. In some embodiments, the system may be used to identify animals developing signs of illness and take them for further testing. Optionally, a user may be able to access the current number of sick birds, and/or the number of sick birds at a certain time in the past and/or statistics about the number of sick birds over a period of time and/or the number of chickens newly infected over a certain time period and/or the number of birds whose health improved and/or the severity of the condition of birds (for

example the severity of clinical symptoms and/or quantitative measurements of the aberrations in behavior). The data may be used to track the condition of individuals and/or part or all of the population. For example, the current invention may be useful in identifying a susceptible portion of a population for clinical trials. Alternatively or additionally the current invention may track the effects of an intervention on a disease precursor and/or the effect that the intervention against the precursor has on the health of the population.

16. Mounting

In some embodiments, markings will include a tag connected to an animal. The tag may include a RFID, a visually identifiable tag (for example color coded and/or bar code) and/or an active beacon (for example a remote controlled light). A tag may be attached to an animal by a strap. Optionally, the strap may be configured to expand over time as an animal grows.

Figs. 5A,B illustrate an exemplary embodiment **500** of a strap that grows over time in accordance with some embodiments of the current invention. For example, embodiment **500** includes two elastic belts, a long belt **526** and a short belt **524**. Each end of belt **524** is optionally attached by a respective ring **527, 527'** to a corresponding end of belt **526**. Belts **524, 526** are optionally contained in a soft sleeve **528**. Sleeve **528** may for example, protect the skin on an animal from abrasion. Alternatively or additionally a strap may include single elastic belt that changes length. Optionally the belt may be of a stretchable, for example elastic, for example the belt may be made of lycra and/or latex and/or rubber.

Optionally, the dual belted strap of embodiment **500** is attached around a young animal. Rings **527** and **527'** may optionally serve to hold the strap onto a marker for example as shown in Fig. 6D. While the animal is small, the strap may hold tight to the animal due to short belt **524**. As the animal grows short belt **524** breaks (for example due to stretching) and/or decays at a planned rate and/or is actively released. The strap remains on the larger animal, being held for example by belt **526**. A strap may optionally include more than two belts of different sizes.

Figs. 6A-C illustrate exemplary embodiments of marker for mounting on a chicken in accordance with some embodiments of the current invention. Fig. 6A illustrates an overhead view of a marker platform **621a** having remote control releasable

belts **624** and **626** for connecting to a chicken. The exemplary embodiment of Fig. 6A includes eight remotely releasable rings **627a** and two long belts **626** and two short belts **624**. Each belt **624, 626** is connected to the marker by a pair of remotely releasable rings **627a.** When the marker is mounted on a young chicken, one set of belts **624, 626** is wrapped around his right wing and the other set of belts **624, 626** is wrapped around his left wing. While the chicken is small the marker is held by the pair of short straps **624**. When the chicken grows, the rings holding short straps **624** are released and the marker is held on the bird by longer straps **626**. Eventually, when it comes time to slaughter the bird rings **627a** holding long straps **626** are released and the marker falls off the bird. Alternatively or additionally the markers may be removed manually and/or may be designed to fall off during plucking of feathers. The marker may optionally include a beacon. The beacon may light up when it is released to make it easier to find and recover the marker after it falls. The beacon may optionally be lit when a sentinel has been lost to make it easier to re-identify the sentinel. The beacon may optionally be used by a caretaker and/or a veterinarian to locate the sentinel. The beacon may optionally light automatically upon release from the chicken. The beacon may optionally be controlled remotely, for example by a radio signal and/or by an optical signal.

Fig. 6B illustrates a side view of an exemplary marker platform **621b** including an active beacon **616** in accordance with some embodiments of the current invention. Optionally, beacon **616** is raised by post **619** above a mounting platform **621b**. Raising beacon **616** may optionally improve visibility of the beacon, for example when the chicken is in a crowd and/or fluffs his feathers. For example, beacon **616** may be raised between 0.5 to 2.0 cm.

In some embodiments, active beacon **616** may include a light emitting diode (LED). Active beacon may radiate in the IR, Visible, microwave and/or UV spectrums.

In some embodiments, beacon **616** may light automatically from time to time. Alternatively or additionally, beacon **616** may light on demand, for example by remote control. Alternatively or additionally, beacon **616** may light under certain conditions (for example if there is some sign of distress of the host chicken and/or upon falling from the host chicken).

In some embodiments beacon **616** may have recognizable color (wavelength). In some embodiments beacon **616** may send out a recognizable pattern, for example a pattern of flashes that identify the host chicken to the observation system.

In some embodiments platform **621b** may include a strap **624** for attaching to a chicken.

Fig. 6C illustrates a composite embodiment **600c** of an example of a marker platform **621c** having various exemplary embodiments of releasable mounting pins **627c, 627c', 627c'', 627c'''** in accordance with some embodiments of the current invention. Optionally various components of embodiment **600c** may be used separately or in combination with other embodiments of a marker platform.

In some embodiments, marker platform may be mounted to the back a chicken using two straps (for example embodiment **500** and/or strap **624**) attached under respective wings of the chicken. The straps may be connected to retractable pins **627c, 627c', 627c''** and/or **627c'''**. For example, rings **527** and **527'** of embodiment **500** may be hooked to retractable pins **627c''** and **627c'''**. Alternatively or additionally, a simple strap (for example strap **624**) may be hooked onto pins (for example, pins **627c** and **627c'**).

In some embodiments, a marker platform may include a radio receiver **630**. Upon receiving a release signal over receiver **630** a processor **631** may close a switch **633** to connect a release mechanism to a battery **632** activating the release mechanism.

Various embodiments of release mechanisms are illustrated. For example, a release mechanism may be driven by a motor **639**. For example, motor **639** may drive a pulley **641** that spins one or more threaded **634** pins **627c, 627c'''** causing them to retract and release the strap. Alternatively or additionally, the release mechanism may include an electromagnet **637** that retracts a pin **627c''**. Alternatively or additionally, the release mechanism may include a heat sensitive self reforming pin **627c'** (for example the pin may be made of nitinol). For example, to retract pine **627c'** power is sent to a heating element **635** which may heat pin **627c'** to a reforming temperature causing pin **627''** to retract and release strap **624**.

17. Refreshing markings

In some embodiments, markings may undergo changes and/or fading and/or corruption (for example a mark may disappear when a bird molts and/or sheds, holes

may form in a mark and/or a geometry of a mark may change as an animal grows). In some embodiments, an automated system may mark birds. For example there may be an automated bird painter. The painter may use the sensors of the monitoring system and/or a dedicated sensor that detects when an animal is under a color nozzle and sprays a stain on the animal as it passes (the sensor may include for example, a proximity sensor, a camera, eyes sensitive to light, beam of light and/or a sensor that detects whenever an animal crosses the beam). Alternatively or additionally the sensors may include a mechanical sensor.

In some embodiments, marked animal may be re-marked. For example, a manual and/or automatic system may be supplied to refresh an old mark. Alternatively or additionally, a new mark may be placed on a previously marked animal and the system may be updated to recognize the new mark and associate it with the correct animal.

In some embodiments, birds may be marked without regard to previous markings. Marking birds may optionally be manual and/or automatic.

Fig. 7 illustrates an exemplary method for marking sets of animals in accordance with some embodiments of the current invention. For example, an initial set of sentinel animals may be marked **736**. For example, marking **736, 740, 744** may be automated (for example by a machine that may paint the animals that pass a certain location) and/or marking **736, 740, 744** may be manual. Optionally the system will track **738** the first set of sentinels, for example in order to monitor the health of the population. As marks on the first set of sentinels decay, a second set of sentinels may optionally be marked **740**. Optionally, during a transition period, the system will track **742** both the first set and the second set of sentinels. For example, in the beginning the first set may be tracked **742** to monitor the health of the population and the second set may be tracked **742** to build up historical data in personal and/or group data files. Optionally, at some point both the first and second group may be tracked in or to monitor the health of the population. As the marks of the first set become more difficult to discriminate, a third set may be marked **744**. Optionally, the second and third set will be tracked **746** together to monitor health and/or build up a historical database. As time goes new groups may be marked and tracked as old groups become unrecognizable, for example until the animals are send to slaughter **748**. Alternatively or additionally, more than two sets of sentinels may overlap and/or there may be no transition period and only one set of sentinels may be tracked at

a given time. New sets of sentinels may be marked periodically. For example every three to thirty days new set of marks may be made. The new marks may be placed on previously marked animals and/or on new animals. During an optional transition period the system may monitor multiple sets of sentinels and after the transition period the system may stop monitoring one or more of the old sets of sentinels.

The system may recognize that an animal is dead for example due to lack of breathing movements and/or due to lack of locomotion over a long period (for example between one and three hours). A user may inform the system of the death of an animal. For example the user may take a picture of the animal or an identity tag (for example using a cell phone) and send the picture to the system (for example via the Internet); alternately or additionally a user may have a sign the he leaves in place of a dead animal such that when the system detects the sign it marks that animal that had been in that location as dead (the sign may optionally be moved once the system has detected it); alternatively or additionally the user may hold up a dead animal in front of a camera for a prescribed period of time as a sign that it died; alternatively or additionally, there may be a location for placement of dead animals and the system may periodically check the location.

18. Adjusting for a lost animal

Fig. 8 is a flow chart illustration of an exemplary embodiment **800** of a method to adjust **853** optical tracking of livestock in response to losing **852** track of one or more animals in accordance with some embodiments of the current invention. The method optionally includes one or more of four general strategies: searching **854** for the lost animal, giving an estimated accounting **856** for the lost animal, continuing tracking **860** the rest of the animals with optional compensations for the changes in the number and/or content of the sample, replacing **858** the lost animal with a new animal. Optionally, there may be a transition **857** period during which a history of the new animals is being developed. For example, during the transition **857** period the weight and/or analysis of the data from the new animals may differ from animals that have already been tracked for a long time. Optionally, if a large number of animals are getting lost, the system may adjust tracking to avoid further loses. For example, the system may increase the frame rate. For example the system may send a message to a user that better tracking is needed

(for example more cameras and/or better lighting and/or more computing power to increase the frame rate.

In some embodiments, searching **854** may be focused in a selected **862** location and/or time. For example, the search may be focused in a vicinity where the animal was lost and/or in a predicted direction of movement and/or in a vicinity where the animal is accustomed to go and/or in a vicinity where animals generally pass by and/or in an area of enhanced sensing resolution and/or the search may be made when there are free resources (for example at night when animals may be moving less and tracking optionally require less resources) and or at night when there is less background light and/or movement and it may be easier to spot the lost animal. Alternatively or additionally, searching **854** may be over the whole domain of the population and/or constantly over time.

In some embodiments searching **854** for a lost animal may include optical scanning **859** to locate the lost animal. Optical scanning may optionally include dedicating **861** resources of an optical sensor system to finding the lost animal. For example, a sensor **855** used for tracking animals may be used for part of its time to scan for the lost animal. Alternatively or additionally, processing **869** resources may be dedicated **861** to searching for the lost animal in existing images. The search may optionally include improved tracking in images from the time that the animal was lost to try to retrace the tracking of the lost animal. The search may optionally include analyzing past images and/or data on the lost animal to ascertain an identifying characteristic with which to recognize the missing animal (for example the animal may have customary locations where he may be found and/or may have an easily spotted behavior and/or mark). The search may optionally include analyzing a current image to recognize the lost animal. Alternatively or additionally both sensing and processing resources may be dedicated to searching for the lost animal.

In some embodiment, searching may include use of non-optical **864** recognition means. For example animals may have been mounted with a non-optical location means. For example an animal may be mounted with a RFID that allows identification of the animal when he comes near an RFID reader. For example the animal may be mounted with a radio locator and/or a GPS detector and a data transmitter that may report the location of the animal. Optionally, non-optical **864** recognition means may be activated

automatically periodically and/or be activated remotely (for example by broadcasting an activation message) and/or may be activated by some secondary occurrence (for example when the animals approaches an RFID reader located by a feeder) and/or may be activated by an intervention (for example herding animals through a gate containing an RFID reader).

In some embodiments enhanced **863** optical means may be used to search **854** for the lost animal. The enhanced **863** optical means may include for example a light source. For example, a UV **876** light source may be used, for example, to cause a fluorescent marker to glow and/or a IR **872** radiation source and or sensor may be used, for example, to bring out a IR marking (that may be seen for example with a IR sensor). Alternatively or additionally a reduced lighting condition may be used, for example, to make a glowing fluorescent marker easier to spot. Alternatively or additionally a narrow band **882** sensor and/or light source may be used, for example to make the lost animal easier to spot with respect to other marked animals. Alternatively or additionally a high resolution sensor **880** may be employed and/or a high intensity light source (for example increasing the lighting intensity over the background intensity of the animal pen). Alternatively or additionally, an active beacon **878** may be used. For example a LED beacon may be mounted on the animal. For example, the beacon **878** may be activated remotely and/or automatically from time to time or due to some occurrence, for example when the animal enters a certain area. Alternatively or additionally, searching may employ both optical and non-optical means.

In some embodiments, a lost animal may be replaced. For example, a new animal may be taken into the sample. The new animal may be fresh and unknown and/or the system may have reserve animals that it tracks and incorporates in the sample when needed. Optionally, the new animal may be chosen to have characteristics (for example sex, age, genetic characteristics, weight, and/or history etc.) similar to the lost animal.

In some embodiments, a lost animal may continue to be accounted **856** in the sample. Optionally the animal may be accounted **856** for a limited time or for an unlimited time. For example, the system may extrapolate from the animal's previous condition and/or behavior to predict a current condition and/or behavior. The predicted condition may optionally be averaged into the sample. Optionally, the predicted data from the lost animal may be weighted **866** differently from real data from other animals.

For example, in the first day after the animal is lost the predicted data may have half the weight of real data from other animals and on the second day a quarter of the weight etc. Optionally, the system may assume that the lost animal is not turning up is because it is dead and/or sick **874**. For example, if the lost animal has an RFID which should be read when he goes to eat, his not showing up may be a sign of sickness or death. Alternatively or additionally, the fact that a lost animal is not detected may be assumed to mean that he is normal and healthy **875** (otherwise he might draw attention to himself).

In some embodiments, after an animal is lost, the system will continue tracking the remaining sample of animals. The continued tracking may optionally include compensating **860** for the missing animal. For example, the system may put an extra weight on data from animals with similar characteristics to the missing animal for example to make the sample of animals more closely representative of a larger population. For example, if the missing animal was a female, the system may put an additional weight on female animals to balance the missing animal.

19. Adjusting for confusion of identities

Fig. 9 is a flowchart illustration of an exemplary embodiment **900** of a method of adjusting **953** tracking of a sample of animals when the identities of some of the animals become confused in accordance with some embodiments of the current invention. The terms confused and unidentified are used herein both for animals whose identities are totally undifferentiated and animals for whom there is some basis to differentiate their identities but there remains a significant confusion about their identities. for Optionally, adjusting may include one or more of: re-identifying **954** the unidentified animals, replacing **958** the unidentified animals, continued tracking **956** of the unidentified animals (optionally making allowance for the in-exact identification) and/or tracking **960** the remaining animals (optionally tracking the remaining animals with optional compensations for the changes in the number and/or content of the sample.

Generally confusion between individuals will occur where tracking breaks down and/or when animals cannot easily be differentiated. For example this may occur when animals are not marked with individually distinguishable markings (for example when two animals have the same marking). For example, this may occur even animals are marked with individual markings, but the markings are not clearly discernible. For

example there may be a location where the resolution and/or the lighting are not good enough to discern individual markings. For example, the markings of the unidentified individuals may have become difficult to distinguish due to dirt, wear, molting (for example of hair or feathers on which a mark is painted).

In some embodiments, the system may attempt to re-identify **954** the unidentified animals. Re-identification **954** may optionally be in a selected **862** time and/or location, for example similar to searching **854** for a lost animal. Re-identifying **954** an animal may include optical **959** and/or non-optical **864** means and/or a combination thereof.

In some embodiments, unidentified animals may be replaced **858** with new animals. Replacing **858** animals may be used, for example, when the markings on one or more animals become difficult to recognize. Optionally, there may be a transition **957** phase. During the transition phase, the unidentified individuals may continue to be tracked.

In some embodiments, tracking may continue **956** for the unidentified individuals. Optionally, old observations **965** of each unidentified individual before their identities became confused and new observations **967** are ascribed **972** to each individual with a weight depending on the degree of confusion of the animal's identity. The criterion to judge the behavior of the individual may optionally be adjusted with regards to old observations **967**, new observation **965** and/or weights **966** optionally depending on the degree of confusion in the identification of the individuals. New observations **967** may optionally be compared **984** to old observations **967** may be compared to clarify **986** the animals' identities. The data for an unidentified animal may be stored under a temporary folder and/or under a temporary identification as long as there is significant doubt about the animal's identity. Upon identifying the animal, the temporary data may be integrated into the animal's permanent record.

For example, consider a case where a first animal-A becomes confused **952** with a second animal-B. In the example animal-A was an unusually active animal with an activity score of 80 and animal-B was unusually passive animal with an activity score of 30. It is believed with 70% certainty that a first ambiguous animal-0 is really animal-A and a second ambiguous animal-0' is really animal-B. In general in the example, an animal whose activity level is reduced points in the activity scale from a previous level is considered sick. In the example each ambiguous animal will be assigned a historical

activity value equal to the weighted **966** average of the previous values of animals-A,B. For example, animal-0 will be ascribed **972** an historical activity value of 0.7(activity of animal-A)+0.3(activity of animal-B)=0.7(80)+0.3(30)=65 and animal-0' will be assigned an historical activity value of 0.3(activity of animal-A)+0.7(activity of animal-B)=0.3(80)+0.7(30)=45. Due to the uncertainty of the identities to be labeled sick will require a greater degree of reduction of activity. For example the criteria may be adjusted **974** by divided the criteria for an identified animal by the uncertainty. In the example, the reduction criteria for an identified animal, 10 points, will be divided by the degree of certainty 0.7 so that an animal-0,0' will be labeled sick if his ascribed **972** historical activity is reduced by 10/0.7=14 points. Thus the measure activity of animal-0 is less than 65-14=51 he will be declared sick. If animal-0' is found to have an activity less than 45-14=31, he will be declared sick.

If for example, the measured activity of animal-0' is 64 and the measured activity of animal-0' is 33 then the correlation of the newly measured activity values with the old values corroborates the identity of animal-0 with animal-A and animal-0' with animal-B. For example the certainty of the identification may then be increased, for example in the next step the certainty levels will be clarified **986** to 75% certainty that animal-0 is really animal-A and animal-0' is really animal-B. Optionally in the next time step the ascribed **972** activity values will include a weighted average of the new observation **965** and the ascribed **972** old observation **967**. For example the historical value for animal-0 will be (64+[0.75(80)+0.25(30)])/2=66 with a certainty of (0.75+1)/2=0.88. Within the scope of the current invention other weighting schemes and criterion may be developed to clarify **986** identities. For example identities may be clarified based on tracking, appearance, behavior etc.

Fig. 10 illustrates a schematic view of a sensor **1024** in a chicken house in accordance with some embodiments of the current invention. Sensor **1024** may include, for example, a digital camera with a fisheye lens (for example the lens may be a wide angle lens of between 6 and 20 mm and/or the field of view may be between 120° and 170°). The fisheye lens may allow relatively clear viewing of chickens directly under the lens, for example in zone A. In zone A, sensor **1024** may for example facilitate distinguishing between markings on animals and identifying individual animals in zone A. On the other hand in zones B on the periphery, resolution may be poorer and/or there

may be significant distortion. In zones B sensor **1024** may for example facilitate tracking an individual but low resolution and/or distortion may make it difficult to positively identify the animal based on markings.

Sometimes an animal in zone B may be positively identified (for example he has been tracked since leaving zone A).

Fig. 11 illustrates an exemplary method of continuing tracking after confusion of the identities of two or more sentinels in accordance with some embodiments of the current invention. Sometimes the identity a sentinel may become confused **952** (for example the fine differences between markings of individual sentinels may not be distinguishable, but the presence of markings delimitating an animal as a sentinel may still be recognizable for example due to one or more of being in a low resolution zone, being blocked from the camera, poor lighting and/or dust). The system may optionally assign **1156** the sentinel a temporary identity and track him. When it becomes possible to identify **1186** the sentinel (for example when an animal moves from zone B to zone A), the system will then take the stored data and integrate **1172** it with the sentinel's original file. In some cases it will not be possible to identify **1186** a sentinel from his own markings, but it will be possible to identify **1186** him using a process of elimination.

In some embodiments, it may occur that two or more sentinels cannot be re-identified **1186**, but nevertheless they can be differentiated and tracked. For example the original markings on a few sentinels may become indecipherable, but remain distinguishable from another animal and/or the individual may be tracked even though its markings are no longer clear. In such a case the temporary identity may optionally be made permanent **1190**.

20. An automatic chicken marking device

Fig. 12 illustrates an exemplary embodiment of an automatic chicken marking device in accordance with some embodiments of the current invention. Optionally, when a chicken reaches a predetermined position in a box **1288** he may optionally be detected by a sensor **1255**. Optionally Upon reaching the predetermined location a marker **1216** is sprayed onto the chicken by an automated sprayer **1289**. Sprayer **1289** may include for example pressurized tanks of paint and/or computer controlled valves and/or sprayer **1289** may work for example like an inject cartridge of a printer.

In some embodiments, marker **1216** may include a coded individual marking and/or an orientation mark and/or a tracking mark. Optionally mark **1216** may be sprayed on an animal's head, back, tail or other body part.

In some embodiment, sensor **1255** may indicate the identity of a chicken (for example in some embodiments a chicken may have an RFID on its head and sensor **1255** may include an RFID reader). For example, the marking device may be used to recognize a sentinel and remark him with a specific pattern when his old marking fades. Alternatively or additionally, may not recognize the identity of a chicken. For example, the identity of the chicken may be supplied by an optical sensor that saw the chicken when he entered box **1288**. Alternatively or additionally, the marking device may be used to point a mark an unidentified chicken.

21. Detecting a condition of an individual and/or group

FIG. 13 is a flowchart illustrating an exemplary embodiment of a method for analyzing a condition of an individual sentinel and/or the group of sentinels and/or the population of animals in accordance with some embodiments of the current invention.

The background of the analysis may optionally include assessing **1391** the status of the group. Data may be collected **1392** on behavior and/or appearance of individual sentinels. Alternatively or additional data may be collected on environmental conditions and/or on group behaviors. The collected data may be processed **1393** for example to normalize for confounding environmental conditions and/or by computing statistical summaries etc.

The data may optionally be integrated **1394** to analyze the status of the virtual flock of sentinels. The status of each individual may then optionally be compared **1395** to the virtual flock. Comparison **1395** may be useful for example to differentiate individual changes in status (for example getting sick, recovering, breeding etc.) from changes that are occurring on other levels (for example environmental changes, changes occurring due to growth [For example chickens are raised in large groups of the same age birds. The birds grow and change very quickly, comparison of the individual to the group may help differentiate changes due to growth and changes due to disease or other factors]). Comparison may optionally include comparing an individual to group statistics for example mean and standard deviation. Comparison may optionally include computing a rank with respect to a certain behavior [for example the 14th most active,

the 150th largest drinker etc.). The system may optionally look for and/or analyze **1396** changes in the relationship between the individual and the virtual flock. When an animal's condition is deteriorating **1397** and/or when the condition is significant **1398** to the entire virtual flock and/or when there is a significant change **1399** in the status of the virtual flock, a user may be notified **1377**. After completing the analysis, the system may update and/or fix sentinel identities **1386** and return to assessing **1391** the group status.

Current (real time) and historical statistics and measurements describing the conditions of individual sentinels, the virtual flock and/or the entire flock may be made available to caretakers, veterinarians, health inspectors etc. The data may be downloaded for example over the Internet. Alternatively or additionally data may be made available through a dedicated user interface and/or via messaging.

Figs. 14 and 15 show an exemplary healthy bird trajectory **1429** and an exemplary sick bird trajectory **1529** respectively each measured from images made every ten seconds over a twenty minute period in accordance with some embodiments of the current invention. Generally, it is seen that a healthy bird may, for example, walk faster and/or further than a sick bird. A healthy bird may, for example, walk more and/or rest less than a sick bird. A healthy bird may, for example, spend more time eating and/or walking and/or drinking than a sick bird. A healthy bird may, for example, walk for longer periods and/or rest less often than a sick bird.

For example on trajectories **1429** and **1529** each spot where the chicken was detected in one image is marked "t". When the chicken was found in a single place in three consecutive images (for example because it stayed in place for more than 30 seconds) then the spot is marked in the figure as t×3. Locations where the animal ate are marked t_f and locations where she rested t_r and locations where she drank $\mathbf{t_d}$. An exemplary feeder **1422** and exemplary watering trough **1420** are depicted.

Comparing Figs. 14 and 15, it can be seen that in the example, the healthy bird (Fig. 14) may, for example walk further than the sick bird (Fig. 15) (the length of trajectory **1429** is greater than the length of trajectory **1529**). It can be seen that in the example, the healthy bird (Fig. 14) may, for example, walk faster than the sick bird (Fig. 15) (the distance between points on trajectory **1429** is greater than the distance between points on trajectory **1529**). It can be seen that in the example, the healthy bird (Fig. 14) may, for example rest less than the sick bird (Fig. 15) (the total rest time on trajectory

1429 is 6+15+30+10+20=81×10sec=810 sec. which is less than the resting time of trajectory **1529** 30+12+35+25=97×10sec=970 sec. It can be seen that in the example, the healthy bird (Fig. 14) may, for example eat more than the sick bird (Fig. 15) (there are three feeding events on trajectory **1429** for total feeding time on trajectory of 7+4+5=16×10sec=160 sec. which is more than the number and length of feeding events on trajectory **1529** (one feeding event for a total of 5×10=50 sec). Similarly, the healthy chicken drinks more. In some embodiments the ratio of time spent in various behaviors may be computed. For example, the ratio of time walking to time static (for example time static may be the sum of time eating, drinking and resting $t_s=t_f+t_d+t_r$). For the healthy chicken, the ratio is 17/103=0.17; for the sick chicken the ratio is 10/140=0.09. For example the ratio of walking to resting time is 17/81=0.21 and for the sick bird it is 10/102=0.10.

22. Behavior changes signaling an impending epidemic/disease and/or stress problem

Referring now to the drawings, Figures 16A,B are a schematic illustrations of an exemplary embodiment of a small behavior change that may be a precursor to an epidemic in accordance with some embodiments of the current invention. For example, as a pathogen begins to spread in a population, groups of the population may get a low level infection and recover. The low level infection may, in some cases, not produce clinical symptoms of the disease and/or minor symptoms, but it may, in some cases, cause measurable behavior changes using the vitality meter, for example, acceleration and/or an optical observation system. For example, reoccurring low order infections may produce waves of behavior aberrations. The waves may, in some cases, grow with time. Alternatively or additionally, the behavior changes may grow continuously. Growth may be an increase in the number of animals affected and/or an increase in the time for recovery and/or an increase in the intensity of the behavior changes and/or aberrations and/or increasing frequency of occurrence.

For example, Figure 16A schematically represents the number of animals in a section of a poultry house showing unusual nocturnal activity. Unusual nocturnal activity may include increased movement, increased rolling, decreased rolling, decreased time sleeping, increase nocturnal bowel movements, increased nocturnal visits to water and/or other activities.

In the example, a group of animals may be affected by a low level infection and or an external parasite and/or an environmental disruption (for example too much light and/or noise at night). The condition may not have obvious clinical symptoms, but it may disturb the animal's sleep. Such infections may be important to catch early for example because they may reduce productivity of the animals and/or weight gain and/or the parasites might spread a more significant disease and/or lead to social breakdown for example pecking and/or fighting and/or reduce the resistance of the animals to a more serious infection. Sleep disturbances may also be a result of other conditions for example, it may be an early sign of an outbreak of a respiratory infection and/or the parasites may be a secondary effect of some other disease for example causing the animals to clean themselves less. Alternatively or additionally, other signs of illness and/or disease that may be monitored include deaths, reduction in weight gain, reduction in efficiency of food conversion, changes in appearance (for example, skin infections, fluffed un-groomed and/or dirty feathers), an increasing in grooming, a decrease in grooming, an increase in pecking, and increase in fighting, huddling of animals together, reduction in activity, reduction in specific activity, increase in resting and/or sleeping, and/or decrease in resting or sleeping.

In the exemplary graph, baseline nocturnal behavior is shown for the first 9 days. In the example, around day 10, a few animals are affected by a parasite. Optionally, they may not show clinical signs of illness but may be disturbed at night causing increased nocturnal activity. The increased nocturnal activity **1624a** may optionally not be statistically significant in and of itself and may optionally not arouse any alerts. In the example, the first group of animals recovers by the thirteenth day. On the fourteenth day of the example a second group is affected. Since the pathogen may have spread since the first infection, the second infection may be more serious (more animals may have been exposed and their exposure levels may be higher). This results in a second wave of high nocturnal activity **1624b**. The second wave may have a longer length (continue for more days) and a larger amplitude (the peak nocturnal activity is higher) than the first wave. Optionally, the increasing wave of behavior aberration may trigger sending an alert to an animal manager. The first alert may for example have a low level of certainty.

The second group of animals may, for example, recover by the eighteenth day. Starting on the nineteenth day another, larger group may start having increasing

nocturnal activity **1624c**. In the example, the higher significance of the third event (nocturnal increase in activity **1624c**) and/or the obvious growing wave pattern may trigger a high certainty alert of a coming epidemic.

In the example, before recovery of the third group nocturnal activity **1624d** starts to increase again due to further spreading of the condition. In some embodiments, there may be a constant rise as the pathogen becomes more and more spread through the population until the epidemic becomes clinical with large numbers of sick and/or dying birds.

In the example of Figure 16A, the behavior being observed is Sleep disorder. Such disorders would not be apparent to a veterinarian examining the birds during the day and/or looking for clinical signs of disease. Night sleep disorder may optionally be monitored automatically, cheaply, non-invasively, and/or continuously. Real-time information may optionally be sent to remote caretakers and/or experts. Various methods may be used to detect nocturnal activity, for example, a motion detector and/or a camera.

In the example of Figure 16A, the wave length of pre-clinical outbreaks is of the order of a few days and/or may include subtle non-clinical behavior changes. Convention health monitoring may be done at large time intervals that may miss the pre-epidemic outbreaks. For example, a veterinarian visiting a poultry house every few days may not observe the cyclical behavior. Often, using conventional health monitoring (for example a visiting veterinarian) will only catch the outbreak when it includes a secondary infection and/or complication. The conventional monitoring may in some cases not recognize the importance of the primary cause (for example too much light and/or noise at night and/or a preliminary low level infection and/or a minor ailment like external parasites). Alternatively or additionally, sometimes by the time conventional monitoring recognizes the problem the primary cause may have passed (for example the infection ended and/or the early susceptible animals already died off). If the primary cause is not fixed, then the secondary infection (or another secondary problem) may reoccur.

In some embodiments, monitoring as described herein may optionally include observations at higher frequency than conventional methods and/or may optionally observe more subtle behavior changes than conventional methods. In some cases this may lead to recognition and treatment of the primary cause of a problem and/or a more

stable solution to the problem. For example, a veterinarian may be called in at the beginning of an outbreak and use laboratory tests (for example polymerase chain reaction PCR) and/or more astute observation to find the primary cause of the problem. Alternatively or additionally, the method described herein may recognize problems earlier than convention methods allowing more effective treatment. For example, a veterinarian may be directed to check one of the animals that showed the disturbed sleeping patterns and on examination find the parasites.

In the example of Fig. 16A, the predicting epidemics via observation of repeated behavioral aberrations may, for example recognize the upcoming epidemic between one and twenty days before the onset of significant clinical symptoms that would be observed by conventional monitoring. Monitoring the health status of a poultry house through conventional counting and/or examining clinically sick and/or dead birds may not catch the epidemic until the thirtieth day when the pathogen has spread enough to significantly affect a large portion of the population. In some embodiments, early intervention may prevent serious damage. In some embodiment, late intervention may be much more expensive and less effective than early intervention.

Alternatively or additionally there are many behaviors that may be monitored as early warning for an epidemic. For example, food and/or water consumption and/or nocturnal and/or daytime activity and/or noise levels and/or manure production and/or amount of time in various activities such as walking, preening, sleeping, eating maybe monitored for the entire flock and/or for a sample of the flock and/or for particular individuals in the flock may be monitored. For example, the number of animals performing a given activity at a given time may be monitored. For example, a reduction of the number of animals preening and/or an increase in the number of animals sleeping at noon time may be a behavior aberration.

In some embodiments global behaviors may be monitored along with and/or in place of individual monitoring. For example the total food consumption of a poultry house may be monitored. The monitoring may be at a high temporal resolution to allow recognition of temporal patterns changes in eating behavior. For example, the average activity level of an entire flock or a large sample may be compared to other flocks and/or samples and/or to expected behavior of a flock.

The expected behavior of groups and/or individuals may optionally be adjusted for the breed and/or type of animal and/or the age, and or the season and/or the local climate and/or the time and/or the date and/or the altitude and/or the temperature other factors.

Figure 16B illustrates a case of a behavior **1624e** that is constantly increasing. Increase may optionally also be a sign of an outbreak. In some embodiments, the increase may be linear, exponential, and/or follow some other pattern.

Figure 17A illustrates an exemplary floor plan of a poultry house in accordance with some embodiments of the current invention. Alternatively observation may be of one or more subgroups of the population. For example, monitoring may be of animals in the vicinity of one or more local measuring stations around the house. Each station may optionally sample behavior of birds in one or more local zones **1734a-d**.

In some embodiments a diseases may break out starting at one area (for example zone **1734a**) and spread to other areas (for example zones **1734b-d**). In the area of the outbreak source, changes may become noticeable faster than when treating the poultry house as a single unit. Alternatively or additionally, spatial spreading of a behavior aberration may optionally be analyzed to indicate the beginning of an epidemic.

For example, the poultry house of Fig. 17A may contain 20,000 animals. The poultry house may include four sections divided by three barriers **1740**. Each section may contain a more or less stable population of approximately 5,000 birds. Measuring stations may measure a behavior of the birds.

Optional barriers **1740** may optionally discourage and/or prevent birds from changing sections. In the example of Fig. 17A, air is supplied across the entire house by an intake **1736** and exhaust **1738**. Water is supplied via watering devices located along optional watering lines **1732** and food is supplied by feeders **1730** spread around the house.

For example, in Figure 17A sampling stations may measure a behavioral parameter. In some embodiments, each station may measure one or more aspects of individual and/or group behavior in the local area. The measurement may be visual (for example by cameras) and/or measurements may use RFID's mounted for example on animals and RFID readers mounted for example on and/or near feeders **1730** and/or watering lines **1732**.

Figs. 17B-17E show time lapsed schematic views of the poultry house of Fig. 17A in accordance with some embodiments of the current invention. For example, Fig. 17C shows the situation seven days after Fig. 17B. For example, Fig. 17D shows the situation seven days after Fig. 17C. For example, Fig. 17E shows the situation seven days after Fig. 17D. In the example of Figs 17B-17D, a sample of five hundred birds amongst the 20,000 birds of the poultry house which are marked for individual observation. For example, in Figs. 17B-17D, each of the sample birds has a color coded tag and when the bird approaches a feeder a camera recognizes the bird and records how many times he puts his head down to peck at the food. Alternatively or additionally an RFID system could be used rather than colored tags and/or the time spent by the feeder may be measured.

In Fig. 17B-D a letter "x" represents a single bird that has aberrant behavior, for example, significantly reduction in the amount and/or intensity of the movements, and/or in the number of visits to the food. For example, reduction may be in comparison to a "normal" poultry and/or in comparison to the particular poultry's previous behavior and/or in comparison to the other marked birds in the section and/or in the entire house and/or a ranking compared to other birds etc.

Sometimes a disease will not start uniformly in the entire house, but will be concentrated in one or more sections. For example, in Fig. 17B, a disease begins to break out in the leftmost section of the house, in the zone **1734a**.

In the example, five birds in the vicinity of zone **1734a** show aberrant behavior and seven birds in the whole house. In the example, seven aberrant birds out of five hundred would not be significant and would not be recognized as a likely sign of infection. Five birds out of one hundred may set off a preliminary alert. For example, the system may start making more measurements.

Sometimes a disease will remain concentrated in one section, sometimes the disease will spread to an adjacent section and sometimes the disease will skip to a non-adjacent section. Spreading from section to section may take a few days. Sometimes spreading will be faster or slower. In some cases the disease will be distributed around the entire house and not spread from a particular area.

In some embodiments, comparison will be made between sections to recognize an outbreak and/or after an outbreak is recognized. Comparing between sections can

optionally locate an outbreak focus and help farmers to check better what is causing the problem in that area. For example, the disease may be a result of an environmental problem and/or a pathogen. Sometimes disease outbreaks start with sub-clinical changes of behavior that are difficult or impossible to discern by conventional observation.

In the example of Fig. 17C, after seven days, the disease is still localized in the vicinity of zone **1734a**. For example, within the section, the disease has spread such that after seven days, seven birds are showing aberrant behavior. Alternatively, small scale outbreaks may occur within a section and wax and wane. Such waxing and waning outbreaks may be a sign of a coming/developing epidemic as will be illustrated an example below.

In the example of Fig. 17D, fourteen days after the example of Fig. 17B, in zone **1734b** significant behavior aberrations have been detected. In the example of Fig 17D, nine animals are detected showing aberrant behavior in the section of zone **1734a** and six nine animals are detected showing aberrant behavior in zone **1734b**. Spreading of a behavior from one section to an adjacent section may optionally be interpreted as a sign the aberrant behavior is due to a contagious organism and may contribute to setting off an alert. In the example of Fig. 17D, zone **1734c** is shown detecting three animals with aberrant behavior.

In and of themselves, three animals may not be a significant number. In the example of Fig. 17D, where there are already signs of an epidemic spreading towards the section of zone **1734d**, detecting aberrant behavior in three animals may be significant and may optionally contribute to the alert status. In some embodiments the very fact that the behavior is concentrated in a particular zone may signal that it is not a random occurrence, but a sign of some kind of outbreak.

In the example of Fig. 17E, twenty one days after the example of Fig. 17B, aberrant behavior has been even more prevalent is the section of zone **1734a**. There are also signs of more spreading into the section of zone **1734b,c**.

Figures 18A-C illustrates resulting measurements from the example of Fig. 17B-D in accordance with some embodiments of the current invention. The exemplary measurement outputs of zone **1734a** are shown by curve **1842a**. The exemplary measurement outputs of zone **1734b** are shown by curve **1842b**. The exemplary

measurement outputs of zone **1734c** are shown by curve **1842c**. The exemplary measurement outputs of zone **1734d** is shown by curve **1842d**.

Curves **1842a-d** show that, in the example of Fig. 18A, progression of the aberrant behavior may not be a steadily growing progression, but could include a series of reoccurring peaks. In the example of Fig. 18A, the peaks are also growing over time. Either or both of these patterns (reoccurring aberrant behavior and/or progressively increasing aberrant behavior and/or spreading of aberrant behavior may be a sign of an oncoming epidemic/progressing problem).

In the example of Fig. 18A the reoccurring of the aberrant behavior is seen in the repeated rising and falling of curves **1842A-D**. The spreading of the disease is apparent, for example, from the time delay between the curves. For example, the first significant rise in that data from zone **1742a** (curve **1842b**) can be seen at five says days. Moving away from zone **1742a**, the first significant rise in aberrant behavior from zone **1742b** (curve **1842b**) occurs later, for example at fifteen days. Similarly, moving further away from zone **1734a** zone A at zone **1742c** (curve **1842c**) the aberrant behavior became noticeable after eighteen days. Moving even further away from zone **1734a** at zone **1742d** (curve **1842d**) the aberrant behavior became noticeable after twenty three days.

Fig. 18B illustrates exemplary disease outbreak alert levels for the simulated data of Fig. 18A. For example data may be interpreted according to five characteristics: the virulence of the condition the speed at which the condition is developing, the speed at which the condition is spreading, the persistence of the condition in the group and the presence of signs of a known condition. An alert may for example be sent to a caretaker with summary measures: the certainty of the warning and the danger of the condition.

In some embodiments the scale of each characteristic may be assigned an integral value from 0 to 2. For example, virulence may be defined 0=no aberrations 1=non-clinical aberrations 2=clinical aberrations. For example, speed may be defined 0=no increase in aberrations 1=a value jumps by one point in one time period 2= a value jumps by two points in one time period. For example, spread may be defined 0=no spreading, 1=increase one of the factors number of victims OR increase in intensity of outbreak OR spread from one location to another, 2=at least two of the factors. For example, persistence may be defined 0=a single transient occurrence, 1=an occurrence that lasts for at least one day OR reoccurrence of an aberration over a time span of least

one day, 2= an occurrence that lasts for at least two days OR reoccurrence of an aberration over a time span of at least two days.

In some embodiments a warning may include a certainty and/or a danger level. For example, a caretaker may be warned when there is a high certainty outbreak even if it is not terribly dangerous (for example so that the caretaker can take prophylactic measures to avoid complications for example bacterial infections following minor viral outbreaks). The caretaker may be warned of signs of dangerous events even when their identification and/or prediction remain uncertain. For example, in the example of Fig. 18B, the certainty index value is defined as the product of the spreading and persistence values (an aberration that continues and spreads is unlikely to be just a random occurrence). For example, in the example of Fig. 18B, the danger index value is defined by the equation danger = (2 × virulence) + speed + spread + persistence + (speed × virulence).

Fig. 18C illustrates an alternative embodiment of an alert level scheme. In the scheme of Fig. 18C five properties are rated on a scale of from 1 to 5, acuteness, contagiousness, locality (how many sections have been affected), portion of the group affected, the portion recovering from the condition, the certainty that the conditions is not just a random occurrence, and a summary measure of the danger of the condition. When the danger level reaches two or greater a warning message is transmitted to a poultry caretaker.

23. Preclinical behavior changes

In some embodiments, subtle changes in behavioral will be interpreted to provide signs of early development of a disease. For example in some embodiments, a quantity of movements may be measured. A potentially diseased poultry may be identified, for example, if the poultry moves less than expected and/or tends to stand still or lie down more than expected, and/or walks less than expected and/or grooms himself less than expected (for example, grooming may be detected by observing grooming behavior and/or by observing the appearance of the poultry, for example feathers tend to bristle on a bird who does not groom). Other signs of disease may include for example decrease food intake, decreased number of times visiting a feeder, decreased time spent near the food bowl during a visit, decreased drinking, tendency to stand by the warmer areas in the coop and/or a tendency to huddle together with other animals. Many of the above

behaviors will manifest themselves in a general decline in activity (amount and intensity of movements). In some embodiments, aberrations in movement and/or distance traveled by an animal may optionally be measured, for example, by using an accelerometer, a global positioning system GPS or a local positioning system LPS, camera, visual tracking. Alternatively or additionally, aberrant thermal transmissions may be measured, for example using a thermal camera. Alternatively or additionally aberrations in traffic in an animal pen may be measured.

In some embodiments, behavioral changes may be used to detect environmental conditions. For example, a lack of movement in a poultry house may be a sign of the house being too hot. A tendency of the animals to huddle together may be a sign of the temperature being too cold. For example, by measuring food consumption (of individuals in a sample and/or of the whole group) cold (huddling and increased eating) may be differentiated from infections (huddling together and reduced eating). Using behavioral clues the system will permit dynamic adjustment of environmental conditions to suit livestock that is more precise than the rule of thumb methods used conventionally. For example, the temperature can be set until the optimal behavior regime is observed and not according to a fixed rule of thumb temperature (that may not be suited to all flocks, conditions and/or ages). The same behavior based system may optionally be used to adjust crowding, humidity, ventilation, ammonia concentration, and/or a combination of these and/or other factors. Adjusting environmental conditions according to behavioral factors may also allow custom tradeoffs depending on for example economic factors. For example cost can be reduced in an area where fuel is expensive and labor cheap by increased floor cleaning and decreased house temperatures.

24. Data processing

In some embodiments proper processing of measurements may differentiate between healthy changes in behavior and unhealthy changes in behavior. For example, behavior changes over time in healthy animals, for example due to growth and/or maturity changes and/or due to environmental factors. In such animals, behavior of an animal may optionally be compared to the behavior the rest of the flock and/or of a sampled portion of the flock. For example, an animal may be denoted as aberrant if his quantity of movement is different from the mean of the sample by more than two

standard deviations. Optionally, the behavior of the sample as a whole may be monitored. For example an alert may transmitted if the mean movement of sample mean is less than expected for a healthy group of animals. Changes in sample behavior may also be monitored, for example if the sample was above average in its quantity of movement and/or eating and began to behave like a normal flock, an alert may be transmitted.

In some embodiments, data interpretation may account for individual differences. For example, an animal may be ranked within the sample group. For example, an animal that has been in the bottom of the activity ranking may not be flagged sick even though his activity is much below that expected from a "normal" animal of his age. Alternatively or additionally, an animal that has been on the top of the activity ranking may be flagged as sick if his activity drops to the middle of the ranking, even if his activity is "normal". An example of the use of ranking to recognize a sick poultry is described herein below with regards to Fig. 28A-C.

In some embodiments proper timing of measurements may increase the sensitivity and/or the reliability of the measurement. For example, in some cases a sick poultry may be much less active during the day than a normal poultry. On the other hand, at night a sick poultry may be more active than other animals. Optionally activity levels during the day will be computed and/or interpreted separately from nighttime activity. Separating data may make the test more sensitive (for example, the decrease in daytime activity will not be diluted out by the nighttime activity) and/or more specific (for example, a dual test may separate different conditions, for example increased nighttime activity and decreased in daytime activity may be a sign of one disease while decreased activity during both the day and night may be a sign of a different condition).

In some embodiments sampling of measurements may decrease the cost of measurement and/or data processing. For example, the sampling frequency and timing may be optimized to provide reliable while minimizing energy needed by sensors to measure and or transmit data and/or processing load. For example, movements may be measured only if the pass a certain strength. For example, the minimum G-force measured by an accelerometer mounted on the back of a chicken may range, for example, from 0.001G to 0.4G. Samples may be averaged to achieve better reliability. For example, when measuring the activity level of a bird, measurements may be

averaged over intervals of between 5 and 30 minutes and/or between30 minutes and 3 hours. The measurements may be made once in period of between two and three hours and/or between three hours and a daily average. The period at which the measurement is made may optionally be kept the same every day.

In some embodiments, spatial sampling may be optimized. For example, traffic in a poultry house may be sampled at a few strategic locations for example, at and/or near a feeder in a poultry house and/or a fish pond. For example, pressure waves made by fish may be measured near a feeding station. Alternatively or additionally, the quantity and/or intensity of fish movements and/or pressure waves and/or crowding may be measured in the vicinity of feeders and/or other locations. Measurements may be made for example using accelerometers distributed in the water near a feeder (measuring for example movement induced in the water by the fish).

Crowding and distribution of animals may be measured and or compared for example between sections of a poultry house, around a feeder and away from a feeder, around a heat source and/or around a light source and/or around a water source and/or around a ventilation source and/or outlet. Radar and/or sonar may be used for example to measure velocity of movements, quantity of movement in certain areas of a poultry house and/or a fish pond. Optionally, local and/or directional antennae and/or transmitters may be used to control the spatial sampling of measurements. Optionally, an accelerometer may be mounted on a fish (for example by feeding the fish a pellet containing the accelerometer and/or attaching an accelerometer to a fish [for example to his fin]).

In some embodiments, data processing may be done at the sensors. For example a sensor may compute summary statistics of data and transmit only the statistical results. Computations may be simplified, for example to save processing power or memory at a sensor.

Fig. 19 illustrates a few exemplary techniques to compute an activity index from measurements of acceleration over time in accordance with some embodiments of the current invention. In the example of Figure 19, vector the accelerometer is mounted to the back of the poultry and acceleration data is measured in three dimensions. The net mean vector acceleration may be approximately the acceleration of Gravity (1 G upwards). Transient and mean absolute acceleration may vary as the animals travel in a

chaotic fashion around the poultry house. The orientation of the accelerometer with respect to gravity may changes as the poultry moves. For example, when a chicken is standing, the acceleration of gravity may be along the z-axis of the accelerometer; when the chicken lies on its side, gravity may be along the y-axis; when the chicken leans forward (for example to peck at the ground), gravity may be along the x-axis. Alternatively or additionally, absolute acceleration may be measured and/or recorded (for example the net magnitude of velocity regardless of direction). The mean absolute velocity will generally be greater than zero (unless the animal is dead and not moving) and the mean absolute acceleration may be greater than 1G.

Changes of acceleration may optionally be used as a measure of activity of the poultry (for example when the poultry accelerates and/or decelerates and/or when the poultry changes her orientation to gravity). The sensitivity of measurements may be adjusted to detect various movements. For example, the sensitivity of the accelerometer may be adjusted to allow measurements of movements associated with changes of walking pace and/or preening and/or pecking.

For example, activity may be defined as the change of the area under a curve of acceleration over time and computed, for example via by numerical integration. For example, in Fig. 19, the integral is computed by the method of rectangles for example the acceleration $A=Abs[(t2-t1)\times(G2-G1)/2]$ where Abs means the absolute value, (t2-t1) is the time interval and G1 and G2 are the measured accelerations. Optionally, activity may be defined as a length of the curve of acceleration vs. time, which may be measured as $Sqrt[(t2-t1)^2+(G2-G1)^2]$ where Sqrt means taking the square root. Optionally, assuming similar time intervals, activity may be defined as Delta, the sum of the changes of acceleration over time $A=Abs(G2-G1)$. A cumulative movement measure may be the sum of deltas $A_{cumulative}= Abs(G2-G1) + Abs(G3-G2) + Abs(G4-G3)... = \Sigma iAbs(Gi-Gi-1)$.

In some embodiments data may be transmitted from an accelerometer mounted on an animal to a central data processor. Optionally, the raw data may be transmitted. In some embodiments, transmitting all of the raw data may take up a lot of transmitting power. Optionally, power may be conserved by computing an activity index at the sensor and transmitting the index value to the central unit (and not all of the data). Optionally, by choosing a simple index computation (for example the difference

between successive measurements, delta of the example of Fig. 19) computing power of the sensor may be conserved.

In some embodiments, sensors may transmit data to the central processor intermittently. For example a sensor may optionally send at fixed times and/or fixed time lapses. For example, the average activity may be sent every 1-10 min. A sample of the raw data may optionally be transmitted along with averages and/or other processed data. Alternatively or additionally, the sensor may transmit data whenever the quantity of data reaches a threshold. For example, data may be transmitted when a data catch becomes full. In some embodiments data sent at fixed times may not need to include ID information (for example, the central processing unit will recognize the sender based on the time of the transmission). In some embodiments, transmission sent at non-fixed time may include ID information and/or collision detection and/or arbitration. For example, reducing the number of data transmissions may save energy and/or increase the battery life of a sensor.

In some embodiments, data may be processed at the sensor. Processing may optionally reduce the amount of data transferred while preserving the ability of the system to make an accurate diagnosis. For example, data may be transmitted only for accelerations of over one G. Alternately or additionally, data may be stored at the sensor and sent a single signal with the ID may be sent only after a certain amount of movements. For example transmission of data to the central storage and computing unit may be triggered when the quantity of data stored in the sensor memory reaches a threshold. For example, data may be sent when the stored data reaches a threshold portion of the sensor storage capacity, for example when the data fills 50% of the storage capacity. An identification symbol may be sent with the data. In some embodiments, the central processor may estimate a movement and/or vitality level of a particular animal according to the number of data transmissions received from that animal. Alternately or additionally, the sensor may include a chip that accumulated data. The total activity and/or the average acceleration may be transmitted. Alternately or additionally, processed data statistics may be sent with a sample of the raw data. For example, 5-10 measurements may be made during a one second period every 10-30 seconds. Data may be sent at intervals more frequent the data averaging at the processer. The short interval

data transmissions may serve to monitor for sudden collapse of the group for example due to a blast of heat.

25. Remote monitoring and breeding

In some embodiments, a health monitoring system may be used to improve choosing of breeding stock. For example, behavior may be monitored of an animal during pregnancy and/or egg laying. Optionally animals may be bred to have stronger constitutions (for example measured as increased activity) during reproduction, pregnancy, egg bearing etc. Optionally, animals may be bred for social characteristics.

For example, a monitoring system may be used to determine which animals are more susceptible to anti-social behaviors, for example fighting and/or pecking under crowded conditions and/or other conditions that sometimes occur in a poultry house or a fish pond. Such animal may optionally be bred to allow higher density animal production. Other aspects such as speed of recovery from pre-clinical infections and/or robustness of appetite and/or growth during changing conditions and/or exposure to disease may be used to breed animals that have characteristics that may not be obvious to intermittent and/or human observation.

26. Recovery monitoring

In some embodiments a health monitoring system may be used to monitor the recovery of animals from disease. For example, when a disease has spread in poultry house, different interventions may be tried. A health monitoring system may be used, for example, to estimate the effectiveness of the intervention. For example, this may allow a farmer to change an ineffective intervention before it is too late. Alternatively or additionally, different interventions may be tried in different sections of the house. The monitoring system may be used to choose an intervention that is more effective and/or appropriate and/or works faster etc.

In some embodiments, an emergency vaccination or drug intervention may be started and/or the poultry house may be cleaned and/or dried and/or heated to help the birds overcome the infection. Alternatively or additionally, if non-vaccinated animals are showing behavior aberrations, it may be a sign of an impending epidemic of the disease and appropriate early intervention may be taken.

In some embodiments, the system can provide data for quality testing of vaccines. For example, different vaccines (for example vaccines of different companies)

may be evaluated to determine which vaccine produces less side effects and/or which vaccine is more effective at preventing disruption when birds are exposed to the pathogen..For example, animals may be vaccinated and then given mild illness, the system can be used to measure which vaccine in more effective at preventing minor disruption of health and/or welfare. Alternatively or additionally statistics can be accumulated over time to determine which vaccine is most effective at reducing the disruption of a poultry house due to various diseases. For example, the system can give information to help evaluate of the quality of vaccines and the materials used in them, the qualities of various genetic lines of animals that are more or less resistant to disease.

EXAMPLES

Reference is now made to the following examples, which together with the above descriptions illustrate some embodiments of the invention in a non limiting fashion.

In the exemplary embodiment, a sample of two hundred forty chickens in a broiler house of 20,000 chickens where mounted with a vitality meter on their backs. The vitality meter included a 3D accelerometer, a processor, a memory and a transceiver and LED lights. The three acceleration measurements were converted to an absolute magnitude $G^2=(G_x^2+ G_y^2+ G_z^2)$ where G is the acceleration magnitude and G_x, G_y, and G_z are the two horizontal and vertical components of acceleration respectively. Measurements were made for one second out of every ten seconds. During the one second measurement period, the acceleration was measured on each axis 10 times.

For simulation of a commercial system once every 1 hour's data was sent by each vitality meter to a central server. The data included the average activity level (average acceleration) during the 1hour period. Optionally, raw acceleration data or processed data for the last five minutes of each 1 hour sampling period was loaded to the server. The raw data was used to determine the animal's health state (for example, walking, running, preening, and/or lying). At times the raw data was also downloaded on demand, for example when it was desired to track states of a particular bird.

For experimental purposes data was collected more often and raw data was also collected showing the detailed acceleration of each chicken over time.

In the example, the server, optionally, computed activity level and rank chicken of each chicken in the virtual flock of the four hundred sampled chickens every hour. If there was a significant change in the chicken's activity and/or rank an alert was

transmitted to a caretaker. For example, an alert was transmitted if a chicken's activity fell to two standard deviations below the average for the virtual flock. For example, an alert was transmitted if a chicken's activity rank fell at least two places for three hours consecutively. When the caretaker deemed necessary he called for a veterinarian and/or a breeder.

In the example, transmissions for different chickens were spread in time. For example, if one chicken sends data at 6:00, the next chicken sends data at 6:01 and another at 6:02 etc. Along with reporting hourly average vitality, the average vitality in the last five minutes was included in each transmission. Thus, every five minutes there was data available on at least five chickens in the last ten minutes. This may provide advanced warning of acute emergency conditions (for example if the fans break down a fast change in vitality will be observed and a caretaker may intervene).

In the example, when it was desired to examine a particular chicken (for example after an alert for low activity of the chicken) the caretaker activated an optional remote controlled LED light mounted on the chicken for easy identification. Identification tags and sensors were optionally mounted to chickens with a remote release mechanism (for example an electromagnet and/or motor and/or knot with a release and/or cutting mechanism) operated through the central processor. By remote command, the caretaker could optionally cause the tag of any and/or all of the chickens to be released, for example to fall to the floor. The LED was also optionally used to find and recover fallen tags.

27. Acceleration data – states of activity.

Figs. 20A-D illustrate the one second averaged acceleration results for various states of chickens in accordance with some embodiments of the current invention. For example, Fig. 20A illustrates acceleration typical for a chicken while drinking. Line **2060** illustrates the acceleration in the z (vertical) direction. Lines **2061** and **2062** illustrate acceleration in the x and y (horizontal directions). In the example accelerometers were mounted with the x-axis along the longitudinal axis (forward and backward) of the chicken and the y-axis along the lateral axis of the chicken. Optionally, measurements were made at a rate between, for example, 5 and 10 measurements per second on each axis during a one second measurement period every 10 to 20 seconds. At point **2064** the chicken dips his head to drink and/or shakes himself.

For example, Fig. 20B illustrates acceleration typical for a chicken while eating (from 1 sec until 400 seconds) and preening (from 400 sec to 600 sec).

For example, Fig. 20C illustrates acceleration typical for a chicken while walking.

For example, Fig. 20D illustrates acceleration typical for a chicken while sleeping. At points **2066** the chicken rolls over.

In some embodiments, a state of the chicken may be distinguished from acceleration data. For example, in the example, for accelerometers on the chicken's back, if the average acceleration is higher in the x-direction than the z-direction this may be taken as a sign that the chicken is eating, cleaning feathers (for example, his head is down pecking the floor and therefore gravity appears to be in the x-direction). For example, if there are few small changes in acceleration, but occasional switches along all the axes, the chicken may be sleeping (for example she is moving very little and acceleration changes are due to occasionally reorientation of the axes with respect to gravity when she rolls over in her sleep). For example, if there is a lot of activity and the effect of gravity remains steady in the z-direction, the chicken may be walking etc.

In the examples of Figs. 20A-D the majority of movement was in the vertical directions. Therefore accelerations magnitude could be predicted by just measuring vertical movements. Nevertheless, measuring 3D acceleration was found to have a few advantages over measuring just vertical acceleration. For example, sometimes the meter may become move on the chicken and become disoriented. When measuring on only one axis this would give false results whereas measuring on three axes and computing the absolute magnitude may give more robust results. Optionally, the magnitude may be averaged over multiple measurements and/or a time period. For example, the differences between the different axes may be useful in figuring out the state of the chicken. For example one may differentiate eating from walking because the dominance of vertical movement is more pronounced during walking than during eating.

Fig. 21 illustrates an example of changes in activity of a twenty four day old chicken over a day in accordance with some embodiments of the current invention. In Fig. 21 quarter hour averaged acceleration values are shown. Generally, the chicken is less active at night **2150a**. Generally, the chicken is most active in the morning **2150b**. Generally, the chicken is active in the afternoon **2150c** and evening **2150d**.

Fig. 22A illustrates acceleration measurements (one hour averages) for four chickens over a week in accordance with some embodiments of the current invention. The abscissa represents the activity level of the individual chickens. In the example, activity level is defined as the absolute magnitude of acceleration. The measurements were normalized by subtracting the average of all of the sampled chickens and dividing by the standard deviation of the activity level. The ordinate axis is marked by the age of the chickens days:hours:minutes.

28. Activity and health

Thus, the sample average is shown as a line of magnitude zero **2280**. The normalized activity levels **2281a,b,c** of three healthy chickens are shown oscillating close to the zero **2280** line. The activity **2281d** level of a fourth chicken that became sick during the period is also shown.

In the example of Figs. 22A,B the sick chicken can be recognized by his reduced activity level **2281d**. The reduced activity is already apparent at age 32 days when his activity level is consistently between one and two standard of deviation below the average. By 34 days his activity level is consistently at least two standard deviations below the average. These changes in behavior may occur well before a veterinarian would have recognized the condition of the chicken.

Fig. 22B illustrates the acceleration measurements of Fig. 22A without normalizations. The average and difference of the absolute magnitude can be seen.

In Fig. 23A illustrates the normalized activity level **2381** and test results of an example of a chicken that was exposed to a chronic illness at age of approximately 28 days. Fig. 23B marks failures of each of 23 tests shown as an open circle **2382**. On the abscissa is marked the test number. The animal died **2383** at age 39 days.

Tests used to recognized extreme behavior aberrations chickens included, for example some or any of the below tests:

1. single point below minus three standard deviations from the sample average;
2. nine consecutive points are below the sample average;
3. six consecutive periods are declining;.
4. four points of five are below the sample average by at least one standard deviation;

5. two points from three are below the sample average by at least two standard deviations;
6. six points from seven are below the sample average by at least one standard deviation;
7. four points from 6 are below the sample average by at least two standard deviations;
8. five consecutive periods are declining;
9. single point below the sample average by at least 2.5 standard deviations;
10. high standard deviation of raw activity measurements in the last day and a half, standard deviation greater than 1.3×sample standard deviation;
11. high standard deviation of raw activity measurements in the last day and a half, standard deviation greater than 1.5×sample standard deviation;
12. low standard deviation of raw activity measurements in the last day and a half, standard deviation less than 0.38×sample standard deviation;
13. a decline in activity, slope of less than -0.15 - over the last day;
14. a decline in activity, slope of less than -0.08 over last 2 days;
15. a decline in activity, slope of less than -0.05 – over last 3 days;
16. a decline in activity, slope of less than -0.04 over last four days;.
17. a decline in activity, slope of less than -0.03 over last 5 days;
18. a decline in activity, slope of less than -0.026 over last 6 days;
19. a decline in activity, slope of less than -0.022 over last 7 days;
20. a decline in activity, slope of less than -0.019 over last 8 days;
21. a decline in activity, slope of less than -0.019 over last 9 days;
22. a decline in activity, slope of less than -0.015 over last 10 days; and
23. a decline in activity, slope of less than -0.014 over last 11 days.

The above tests represent a high confidence indicator of disease and any one may trigger an alert to a caretaker. Lower confidence warnings may be issued for less extreme aberrations. For example a warning may be issued for any negative slope which lasts for more than 3 days.

In some embodiments the various tests may be interpreted to represent various kinds of conditions. For example tests 13 and 14 may represent a hyper-acute condition taking effect within two days or less. For example, tests 15-17 may represent an acute

condition taking effect within three to five days. For examples tests 18-22 may represent a medium term condition taking effect in six to ten days. For example, test 23 may represent a chronic condition taking more than 10 days to become apparent.

In some embodiments the tests may detect changes in apparently normal behavior. For example, a chicken may not have clinical symptoms of illness and may not display any particular abnormal behavior (for example coughing or fluffed feathers). The chicken may nevertheless be, for example, slightly less active than normal and/or slightly less active than a previous day. The changes may include for example statistical changes in normal behavior. The change in behavior may, for example, not be apparent to an observer walking through the poultry house (for example the observer may not know whether the chicken is resting now after a day of activity or whether she has been uncharacteristically resting all day). Such unapparent changes in activity may be for example early signs of the beginning of an illness and/or they may be for example due to a minor illness.

In some embodiments, similar tests may be used to determine recovery from various conditions. Optionally the tests for recovery may include tests similar to those listed above for disease and negative conditions. In some embodiments, tests for recovery may include tests the opposite of those listed above (for example 1. a single point above three standard deviations from the sample average; 2. Nine consecutive points are above the sample average; an increase in activity, slope of greater than 0.014 over last 11 days).

In Fig. 24A illustrates the normalized activity level **2481** and test results of an example of a chicken that was exposed to an acute illness at age of approximately 30 days in accordance with some embodiments of the current invention.

Fig. 24B marks failures of each of 23 tests shown as an open circle **2482**. On the abscissa is marked the test number. The animal died **2483** at age 36 days in accordance with some embodiments of the current invention.

In Fig. 25A illustrates the normalized activity level **2581** and test results of an example of a chicken that was exposed to an acute illness at age of approximately 28 days in accordance with some embodiments of the current invention.

Fig. 25B marks failures of each of 23 tests shown as an open circle **2582**. On the abscissa is marked the test number. The animal recovered **2583** at age 36 days in accordance with some embodiments of the current invention.

29. Reoccurring behavior aberrations

Figure 26 shows and example of reoccurring behavior changes preceded an outbreak of a viral infection complicated by a bacterial infection in the exemplary poultry house in accordance with some embodiments of the current invention. In the exemplary graph, the abscissa represents the number of birds moving from a healthy state to a sick state on a given day and the ordinate represents the age of the flock. Particularly, in the example of Fig. 26, all sentinel were considered healthy at the beginning of the observation; a healthy chicken was considered to move to a sick state if he failed at least one of the 23 test (listed above) in eight consecutive 1 hour time periods; a bird who was in a sick state was considered to have returned to the healthy state if he did not fail any test for two consecutive days. For example, the graph of Fig. 26, may be used to test the contagiousness and/or spreading of a condition.

At twenty nine days there was a short increase **2624a** in failures including seven of the 240 sample chickens. Such a small increase in failures may in some examples not arouse a warning and/or may raise a very mild warning of a potential future problem. On the 30th day the number of newly sick chickens subsided. On the 31st day there followed a similar short increase **2624b** of failures, now including nine chickens. On the 32nd day the number of newly sick chickens subsided. The repetition of mild outbreaks may in some embodiments activate a warning of a possible epidemic developing, for the example of Fig. 26, on the 29th day and a high likelihood warning on the 31st day. In some embodiments, treatments and/or laboratory tests and/or other measures may have been started by the 29th and/or 31st day. On the 33rd and 34th days there occurred a larger increase **2624c** of failures affected twelve new birds each day. Accounting for the previous two outbreaks, the pattern of growing repeated outbreaks may optionally activate a critical warning and/or emergency intervention on the 33rd day. Such an occurrence without knowing about the previous two waves of infection may optionally have activated a mild warning. In some embodiments, wavelike increasing and decreasing of a change in behavior may be interpreted as a sign of an oncoming infection. In some embodiments increasing sized waves of behavior changes may be

interpreted as a sign of an oncoming disease outbreak and/or other condition. In some embodiments further tests may be made to determine the particular cause of the change of behavior.

On the 34th day the caretaker noticed by conventional observation that a disease outbreak had started and applied antibiotics. Subsequently the number of new cases subsided.

Figure 27A shows total number of tests failed for the same exemplary poultry house as fig. 26 in accordance with some embodiments of the current invention. The abscissa represents the total number of tests failed by the virtual flock and the ordinate represents the age of the flock. For example, the graph of Fig. 27A, showing the total number of tests failed, shows a combination of the virulence of the condition and its contagiousness.

Between twenty seven and thirty days there was an increase **2724a** in failures. At the peak the sick chickens failed a total of forty tests. The number of failures went back down, but then rose to another increase **2724b** of failures, peaking at 55 failures on the 33rd day. There was again a small reduction in the numbers failures and then on the 35th day there occurred a larger increase **2724c** of eighty failures. Until the 34th day, the infection was not apparent to observation by a caretaker. On the 34th day a caretaker noticed that the flock appeared sick and administered an antibiotic. The number of failures decreased with small transient increase **2724d** until the flock recovered (not shown).

In some embodiments, when a condition is defined as a disease outbreak may depend on the nature of the symptoms. For example, in a poultry house, an infection with obvious systems, for example serious difficulty breathing, may become apparent to a caretaker when more than 5-10% of the animals are sick. For such a disease 5-10% infection rate may optionally be defined as the beginning of an outbreak. For example in the example of Figs. 26, 27A,B the caretaker noticed the infection when about twenty of the 240 sentinels (about 8%) where sick. Alternatively or additionally, for a disease having less serious symptoms, for example, mild difficulty breathing, a conventional observer may not notice the disease until 10-30% of the animals are affected. Optionally for a disease with mild symptoms a 10-30% infection rate may be defined as a disease

outbreak. Some embodiments of the current invention may detect changes in behavior that precede an outbreak, for example when they affect 1-2% of the population.

For example, in the example of Figs. 26, 27A,B there was apparently a preliminary viral infection that started around 26 days. The symptoms in each animal were apparently minor and the caretaker didn't notice. Later, a bacterial infection started and some chickens became seriously ill; then the veterinarian took notice. Even after applying antibiotics there apparently remained some sick birds (therefore the number of sick chickens in figs. 27A,B remains high even after administration of antibiotics). The minor change in behavior was not noticed by the caretaker who decided that the treatment worked and the flock was healthy.

In some embodiments, a disease may be apparent to a conventional observer and/or an outbreak may be declared depending on the mortality rate. For example, an outbreak may be declared if more 3 to 5 chickens per thousand chickens die each day. The disease may, for example be apparent to a conventional observer and/or an outbreak declared if more than 5 per thousand die in one day and/or if more than three per thousand die on two consecutive days and/or if more than 2 per thousand die on three consecutive days.

In example of Fig. 27A the presence of health problem was already noticeable by the vitality measurements of an exemplary embodiment the current invention on the 27th day and was clearly recognizable by the 33rd day. Thus, by means of the exemplary embodiment of the current invention, the upcoming outbreak could for example be recognized between one and six days before being recognized by a skilled caretaker.

Fig. 27B illustrates the cumulative number of chickens failing at least one test in the poultry house of Figs. 26 and 27A.

Comparing Figs. 26 and 27B in the example up until day 33, the number of newly sick chickens is approximately equal to the cumulative sick chickens (graphs 26 and 27A are about equal [within 20%] for example increase **2624a** = 7 ≈ increase **2724a'** = 8 and increase **2624b** = 9 ≈ increase **2724b'** = 9). Optionally, because the number of newly sick chickens is similar (within 20%) to the total number of sick chickens one might conclude that the disease is in a lag phase or in a steady state. Because there are continuing waves of increasing amplitude (first 7 chickens then 9 chickens), one might conclude that the disease is spreading. This may set off, for example a mild or a medium

level alert. Optionally an alert may be issued even when the disease appears to be in the lag phase.

Comparing Figs. 26 and 27B in the example on days 33 and 34, the cumulative number of sick chickens suddenly increases **2724c'** much faster than the increase **2624c** in the number of newly sick chickens. One might, for example, conclude that the disease is now in an exponential phase and/or a state of explosive spreading and/or spreading may be undergoing a chain reaction. Exponential and/or explosive and/or chain spreading may for example set off a very urgent alert.

Comparing Figs. 26 and 27B in the example after day 34 (while the flock is recovering), the cumulative number of sick chickens (for example 11 at the transient increase **2724d'**) remains higher than the number of new cases (for example 6 at the transient increase **2624d**). For example, the new cases may be interpreted as continued spreading of some infection [maybe a viral infection that was a precursor and/or complication of the bacterial infection] and/or a new infection). For example, the continued higher value of cumulative sick birds may indicate that at least in some birds, recovery is slow.

In the example of Fig. 26 and 27, the exemplary embodiment of a monitoring system detected a transient increase **2624d, 2724d, 2724d'** of behavior aberrations during the recovery period. Such changes in the state of the sentinels may be an early signal, for sign, of reinfection and/or complications of a previous infection and/or an opportunistic new infection affecting the weakened birds. Conventional observation may be unlikely to pick up on a small change in sick birds when there are previously sick birds present (for example a increase **2624d, 2724d, 2724d'** and/or the continued spreading to new birds during the recovery period). The monitoring system may optionally detect and/or quantify such spreading and/or changes and/or allow for early and/or prophylactic treatment to avoid such complications.

Fig. 28A-C illustrate a histograms the area under the graph of acceleration of a sample of chickens in a poultry house in accordance with some embodiments of the current invention. In Figs. 28A-C, the abscissa represents the quantity of movement (the side of the graph represents right more movement /vitality more healthy chicken, the left side of the chart represents less movement/vitality less healthy chicken) the ordinate represents the number of birds in each vitality bin. In the example of Fig. 28A-C

acceleration was sampled at a rate of five measurements per second and interpreted by summing deltas as described above. In the example of fig. 28A-C, a greater quantity of movement means a greater difference between successive acceleration measurements which may be interpreted as stronger movements.

In Figs. 28A-C, the white bar shows the place of a particular sentinel chicken **2863**. In Fig. 28A chicken **2863** is shown in a healthy state. It is seen that chicken **2863** is a particularly active bird well towards the top of the histogram.

In the example of Fig. 28A-C, the histograms show the change over time of the relative position or rank of chicken **2863** within the sample of sentinels. The histogram is the activity level (this can include for example the amount accumulated of movement in general and/or the cumulative distance walking, the average speed of walking, cumulative time eating or anything characterizes the activity of birds).

Fig. 28B shows the histogram two days after chicken **2863** was exposed to the infection (at 34 days). Chicken **2863** still displays apparently normal behavior (towards the middle of the histogram). Nevertheless, chicken **2863** shows a significant reduction is ranking (no longer at the top of the histogram).

Fig. 28C shows the histogram at 36 days, four days after Fig. 28A. Chicken **2863** is still in the range of normal but shows a very distinct and consistent reduction in ranking. Thus a conventional observer would not recognize chicken **2863** as sick until well after 36 days whereas by tracking the ranking of chicken **2863** by the method of the current application it may optionally be possible to recognize the disease earlier (by the 34 day or even before). Ranking may optionally be used to track the improvement of chicken during treatment. Animals may be ranked in any measured parameter, for example, activity, number of movements, intensity of movement time spent eating/drinking, amount food/water ingested, amount of time eating/walking/preening, distance walked etc.

Figure 29 is a block diagram illustrating an exemplary embodiment of a system for early detection of conditions affecting a flock of livestock in accordance with some embodiments of the current invention.

In some embodiments, the system may include a sensor **2990**. Sensor **2990** may include, for example, an accelerometer, an optical sensor (for example in the visible and/or infra red spectrum), an audio sensor (for example a microphone), a chemical

sensor (for example an ammonia sensor), a weight sensor (for example sensing the weight of a chicken and/or the weight of feed) and/or a RFID sensor. A sensor **2990** may be, for example, mounted on an animal and/or fixed in an animal pen and/or mobile.

Sensors **2990** may optionally be connected to a transceiver **2992a**. Sensors **2990** may optionally be connected to a transceiver. Transceiver **2992a** may optionally be used to transmit data from sensor **2990** to a transceiver **2992b** of a central processor **2998** and/or a transceiver **2992c** user interface **2994** of a caretaker. Alternatively or additionally transceiver **2992a** may be used to receive commands from a transceiver **2992b** of a central processor **2998** and/or a transceiver **2992c** of a user interface **2994** of a caretaker. Central processor **2998** may include a memory **2996**. Alternatively or additionally sensor **2990** and/or user interface **2994** may include a processor and/or a memory.

In some embodiments the system may include a marker **2999a** associated with sensor **2990** and/or a marker associated to an animal **2999b.** Markers may include a passive marker, for example an optical marker (for example a colored mark) and/or an active marker (for example a radio and/or optical beacon). The active marker may include an LED and/or a loudspeaker and/or a radio beacon. For example, the beacon may include a RFID device. The beacon may be activated by a signal, for example from user interface **2994** and/or from processor **2998** and/or sensor **2990**. Alternatively or additional the beacon may be activated automatically, for example when it falls of an animal and/or when an animal displays a behavior aberration and/or or when a sensor malfunctions.

30. Caveats

It is expected that during the life of a patent maturing from this application many relevant technologies will be developed and the scope of the terms are intended to include all such new technologies *a priori*.

As used herein the term “about” refers to ± 5%.

The terms "comprises", "comprising", "includes", "including", “having” and their conjugates mean "including but not limited to".

The term “consisting of” means “including and limited to”.

The term "consisting essentially of" means that the composition, method or structure may include additional ingredients, steps and/or parts, but only if the additional

ingredients, steps and/or parts do not materially alter the basic and novel characteristics of the claimed composition, method or structure.

As used herein, the singular form "a", "an" and "the" include plural references unless the context clearly dictates otherwise. For example, the term "a compound" or "at least one compound" may include a plurality of compounds, including mixtures thereof.

Throughout this application, various embodiments of this invention may be presented in a range format. It should be understood that the description in range format is merely for convenience and brevity and should not be construed as an inflexible limitation on the scope of the invention. Accordingly, the description of a range should be considered to have specifically disclosed all the possible subranges as well as individual numerical values within that range. For example, description of a range such as from 1 to 6 should be considered to have specifically disclosed subranges such as from 1 to 3, from 1 to 4, from 1 to 5, from 2 to 4, from 2 to 6, from 3 to 6 etc., as well as individual numbers within that range, for example, 1, 2, 3, 4, 5, and 6. This applies regardless of the breadth of the range.

Whenever a numerical range is indicated herein, it is meant to include any cited numeral (fractional or integral) within the indicated range. The phrases “ranging/ranges between” a first indicate number and a second indicate number and “ranging/ranges from” a first indicate number “to” a second indicate number are used herein interchangeably and are meant to include the first and second indicated numbers and all the fractional and integral numerals therebetween.

It is appreciated that certain features of the invention, which are, for clarity, described in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention, which are, for brevity, described in the context of a single embodiment, may also be provided separately or in any suitable subcombination or as suitable in any other described embodiment of the invention. Certain features described in the context of various embodiments are not to be considered essential features of those embodiments, unless the embodiment is inoperative without those elements.

Although the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art. Accordingly, it is intended to embrace all

such alternatives, modifications and variations that fall within the spirit and broad scope of the appended claims.

All publications, patents and patent applications mentioned in this specification are herein incorporated in their entirety by reference into the specification, to the same extent as if each individual publication, patent or patent application was specifically and individually indicated to be incorporated herein by reference. In addition, citation or identification of any reference in this application shall not be construed as an admission that such reference is available as prior art to the present invention. To the extent that section headings are used, they should not be construed as necessarily limiting.

WHAT IS CLAIMED IS:

1. A system for monitoring of a condition of a population of livestock comprising:

a plurality of markings for indicating members of a sample of sentinels from the population, some of said markings being non-distinctive;

one or more optical sensors configured for tracking a plurality of individuals from said sentinels over time;

a processor configured for

assessing changes in a behavior of each of said individuals and determining a health state of said individuals based on said changes, and

extrapolating to determine a health state of the population.

2. The system of claim 1, wherein said processor is configured for said assessing said change in at least one item selected from the group consisting of walking, running, flying, drinking, eating, sleeping, preening, standing, sitting, lying and eating.

3. The system of claim 2, where processor is configured for said assessing said change in at least one measure selected from the group a portion of time involved in the behavior, an average session length for the behavior, an average rest length between sessions of the behavior, and an intensity of the behavior.

4. The system of claim 1, wherein said markings that are tracked by said optical sensors include a color that does not disturb said livestock.

5. The system of claim 4, wherein said marking include at least one member of the group consisting of an IR color, a narrow band reflector, and a fluorescent marking, a marker distinguishable using a narrow band filter.

6. The system of claim 1, wherein said livestock are bred to be optically distinguishable.

7. The system of claim 1, further comprising:

an orientation mark configured for placement on at least one of said sentinels.

8. The system of claim 1, further including a device for refreshing said markings.

9. The system of claim 8, wherein said refreshing includes:
marking a first group,
subsequently marking a second group,
simultaneously tracking said first and second group, and
continuing tracking said second group after a significant portion of said marks on said first group become unrecognizable and wherein said processor is configured for tracking said first and second groups.

10. The system according to claim 1, wherein said sensors are further configured to detect a symptom of a disease.

11. The system according to claim 1, further comprising:
non-optical identifier.

12. The system of claim 11, wherein said non-optical identifier includes at least one device selected from the group consisting of an RFID, a coded LED and a radio transmitter.

13. The system according to claim 1, further comprising:
a resolution enhancer.

14. The system of claim 13, wherein said optical sensors are configured for said tracking without activation of said resolution enhancer and wherein activation of said resolution enhancer decreases a probability of non-distinguishable sentinels by at least one half.

15. The system of claim 13, wherein said resolution enhancer includes at least one device selected from the group consisting of an optical detector having a higher resolution than said optical sensors, a visible spectrum light source, a non-visible spectrum light source, a narrow band light source, and an optical band filter.

16. The system according to claim 1, further comprising:

one or more active beacons configured for mounting on said sentinels.

17. The system of claim 1, wherein said processor is further configured to track an unidentified sentinel, storing behavior data in a temporary file and integrate the temporary file with a sentinel file upon recognition of the unidentified sentinel.

18. A system for monitoring of a condition of a population of livestock comprising:

a plurality of markings for indicating members of a sample of sentinels from the population;

at least one zone wherein said sentinels are not individually identifiable;

one or more optical sensors configured for tracking a plurality of individuals from said sentinels over time in said at least one zone;

a processor configured for

assessing changes in a behavior of each of said individuals and determining a health state of said individuals based on said changes, and

extrapolating to determine a health state of the population.

19. The system of claim 18 wherein said process is configured for said assessing of at least one item selected from the group consisting of walking, running, flying, drinking, eating, sleeping, preening, standing, sitting, lying and eating.

20. The system of claim 19, where processor is configured for said assessing said change in at least one measure selected from the group a portion of time involved in the behavior, an average session length for the behavior, an average rest length between sessions of the behavior, and an intensity of the behavior.

21. The system of claim 18, wherein said markings include a color that does not disturb said livestock.

22. The system of claim 21, wherein said markings include at least one member of the group consisting of an IR color, a narrow band reflector, and a fluorescent marking, a marker distinguishable using a narrow band filter.

23. The system of claim 18, wherein said livestock are bred to be optically distinguishable.

24. The system of claim 18, further comprising:
an orientation mark configured for placement on at least one of said sentinels.

25. The system of claim 18, wherein said markings are configured to be refreshed.

26. The system of claim 25, wherein said refreshing includes:
marking a first group,
subsequently marking a second group,
simultaneously tracking said first and second group, and
continuing tracking said second group after a significant portion of said marks on said first group become unrecognizable and wherein said processor is configured to track said first group and said second group.

27. The system according to claim 18, wherein said sensors are further configured to detect a symptom of a disease.

28. The system according to claim 18, further comprising:
non-optical identifier.

29. The system of claim 28, wherein said non-optical identifier includes at least one device selected from the group consisting of an RFID, a coded LED and a radio transmitter.

30. The system according to claim 18, further comprising:
a resolution enhancer.

31. The system of claim 30, wherein said optical sensors are configured for said tracking without activation of said resolution enhancer and wherein activation of said resolution enhancer decreases a probability of non-distinguishable sentinels by at least one half.

32. The system of claim 30, wherein said resolution enhancer includes at least one device selected from the group consisting of an optical detector having a higher resolution than said optical sensors, a visible spectrum light source, a non-visible spectrum light source, a narrow band light source, and an optical band filter.

33. The system according to claim 18, further comprising:
one or more active beacons configured for mounting on said sentinels.

34. The system according to claim 18, further comprising:
at least one zone wherein said individual can be individually identified.

35. The system of claim 18, wherein said processor is further configured to track an unidentified sentinel, storing behavior data in a temporary file and to integrate the temporary file with a sentinel file upon recognition of the unidentified sentinel.

36. A method for monitoring of a condition of a population of livestock comprising:
marking a sample of sentinels from the population;
tracking a behavior of a plurality of individuals from said sentinels over time;

assessing changes in said behaviors;

detecting a health state of said individuals, and

tracking an identified individual when said individual cannot be directly identified.

37. The method of claim 36, wherein said tracking includes tracking by means of an optical sensor.

38. The method of claim 36, further comprising:

extrapolating said health state of said individuals to determine a health state of the population.

39. The method of claim 36 further comprising:

refreshing said markings.

40. The method of claim 36 further comprising:

re-identifying a lost sentinel.

41. A strap for mounting a device to an animal comprising:

a long belt;

a short belt, and

a release mechanism for said short belt

wherein said release mechanism is configured to release said short belt when the animal grows and the long belt is configured to hold the device to the animal after the animal has grown.

42. The strap of claim 41, further comprising:

a further release mechanism for the entire strap.

43. The strap of claim 41, wherein said release mechanism is configured to release by at least one action selected from the group consisting of a remote command,

deterioration of the material over time, breaking due to distending as the animal grows, a timed release mechanism.

44. A system for tracking livestock comprising:
an optical marking that is not visible to said livestock, and
an optical sensor for sensing said marking.

45. The system of claim 44, wherein said marking that is sensed by the optical sensor includes at least one indicator selected from the group consisting of an IR visible coloring, a fluorescent coloring, an active beacon, a narrow band coloring, a narrow field reflector, and a narrow band reflector.

46. The system of claim 44, where said sensor includes at least on element selected from the group consisting of an IR sensor, a UV sensor, and a sensor including a band pass filter.

47. The system of claim 44, further comprising:
a selective illumination source.

48. The system of claim 47, wherein said selective illumination source includes at least one element is selected from the group consisting of an IR illumination source, a UV illumination source, a narrow band illumination source, a narrow field illumination source, an illumination source including a band pass filter and a short burst illumination source.

49. The system of claim 44, further comprising:
a processor configured for
tracking a sample of said livestock marked with said marking, said tracking limited to maximum number of individuals and
determining a status of said sample from data derived by from said tracking.

50. The system of claim 49, wherein said processor is further configured for extrapolating to assess a status of a population larger than said maximum number of individuals based on said data derived from tracking said sample of less than said maximum number.

51. A method of tracking individuals animals in a livestock group comprising:
marking said individuals with an optical marking;
identifying each said individual;
tracking each said individual with an optical sensor, and
adjusting said tracking when one or more of said individuals are lost.

52. The method of claim 51, wherein said adjusting includes improving said tracking in order to avoid further animals from being lost.

53. The method of claim 51, wherein said adjusting includes at least one action selected from the group consisting of searching for said lost individuals by recognizing said marking with an optical enhanced resolution apparatus, search for said lost individuals using a non-optical marking, mark and track a new individual, continue tracking remaining individuals and count said missing individuals as sick and continue tracking remaining individuals, count missing individuals at reduced weight, adjust weighting of remaining animals to account for change in sampled population and count said missing individuals as healthy.

54. The method of claim 51, wherein said adjusting includes searching for said lost individuals by recognizing said marking with an optical enhanced resolution apparatus and wherein said recognizing includes at least one element selected from the group consisting of lighting an active beacon, inducing fluorescence in a fluorescent marking, providing an addition source of visible light, providing an addition source of visible light, providing an addition source of UV light, providing an addition source of IR light, providing an addition source of UV light, making an image with a higher resolution sensor.

55. A method of tracking individual animals in a livestock group comprising:

marking said individuals with an optical marking;

identifying each said individual;

tracking each said individual with an optical sensor, and

adjusting said tracking when an identity of two or more of said individuals are confused.

56. The method of claim 55, wherein said adjusting includes at least one action selected from the group consisting of identifying at least one of said confused individuals by recognizing said marking with said sensor, identifying at least one of said confused individuals by recognizing said marking with an optical enhanced resolution apparatus, identifying at least one of said confused individuals by using a non-optical marking, mark and track a new individual, identifying at least one of said confused individuals by according to a behavior, ascribing to said confused individuals an adjusted behavior, weighting an analysis of said behavior according to an uncertainty of said identity, updating an uncertainty of said identity and continue tracking said confused individuals without counting said confused individuals.

57. The method of claim 56, wherein said adjusting includes identifying at least one of said confused individuals by recognizing said marking with an optical enhanced resolution apparatus and wherein said recognizing includes at least one element selected from the group consisting of lighting an active beacon, inducing fluorescence in a fluorescent marking, providing an addition source of visible light, providing an addition source of visible light, providing an addition source of UV light, providing an addition source of IR light, providing an addition source of UV light, making an image with a higher record sensor.

58. The method of claim 55, wherein said adjusting includes tracking incompletely identified individuals and weighting interpretation of observations according to an uncertainty of identification and expected behavior of candidate identities.

59. A method of monitoring a status of livestock comprising:

tracking an individual of the livestock when the individual is not directly identifiable, and

detecting a change in a behavior of said individual.

60. The method of claim 59, wherein said change is relative to a group of the livestock.

61. The method of claim 59, wherein said detecting includes re-identifying a lost individual.

62. The method of claim 59, wherein there is a location where said individual is directly identifiable in one location and not directly identifiable in another location.

63. The method of claim 59, wherein said detecting accounts for an uncertainty in identity of said animal by weighting a significance of said change.

64. The method of claim 59, wherein said tracking includes making an optical image and analyzing said image.

65. The system or method of any of the previous claims, wherein said livestock includes at least one animal selected from the group consisting of a sheep, a goat, a chicken, a poultry, a turkey, a duck, a goose, a chicken, a pheasant, and a fish.

66. The system or method of any of the previous claims, wherein said method or system is used for monitoring the health of the population of livestock, evaluate the effectiveness of a health intervention, evaluate side effects of a health intervention, and select breeding stock.

67. A method of early detection of a condition in a population of livestock comprising:

monitoring over time changes in a behavior within the population; and

recognizing in said changes a pattern associated with the upcoming condition.

68. A system for early detection of a condition in a population of livestock comprising:

a sensor configured for monitoring over time changes in a behavior within the population; and

a computing and storage device configured for recognizing a pattern of said changes associated with the upcoming condition.

69. The system of claim 68, wherein said computing and storage device includes a memory for storing said pattern.

70. The method or system of claim 67 or 68, wherein said monitoring occurs while population is apparently healthy.

71. The method or system of claim 67 or 68, wherein said changes do not include clinical symptoms of the condition.

72. The method or system of claim 67 or 68, further including:

predicting an outbreak of said condition based on said recognizing.

73. The method or system of claim 67 or 68, wherein said pattern includes a repetition of the behavior.

74. The method or system of claim 67 or 68, wherein said pattern includes spreading of said behavior to different animals.

75. The method or system of claim 67 or 68, wherein a time length of said pattern increases over time.

76. The method or system of claim 67 or 68, wherein said pattern includes spatial spread of said behavior.

77. The method or system of claim 67 or 68, said pattern includes an increasing difference of said behavior from a normal behavior.

78. The method or system of claim 67 or 68, wherein said behavior is a measurement of activity.

79. The method claim 76, wherein said measurement is a quantification of movements.

80. The method or system of claim 79, wherein said movements include non-locomotive movements.

81. The method or system of claim 67 or 68, wherein said monitoring is of identified individual animals.

82. The method or system of claim 81, further comprising:

computing a ranking of said individual within a sample with regards to said behavior and wherein said detecting includes detecting a change is said ranking.

83. The method or system of claim 81, wherein said individuals make up a sample of said population.

84. The method or system of claim 83, wherein said sample is broken into a plurality of subsamples, and said recognizing is done separately for each subsample.

85. The method or system of claim 83, wherein said sample is less than 20% of said population.

86. The method or system of claim 67 or 68, further comprising:

monitoring a spatial location of said behaviors and wherein said recognizing is further dependent on said location.

87. The method or system of claim 67 or 68, wherein said livestock includes at least one animal selected from the group consisting of sheep, goats, fish in a fishpond, and poultry in a poultry house.

88. The method or system of claim 67 or 68, wherein the condition includes a disease outbreak.

89. The method or system of claim 67 or 68, wherein the condition includes a stress.

90. The method or system of claim 67 or 68, wherein the condition includes an interface problem.

91. The method or system of claim 67 or 68, wherein the behavior includes an aberration from a normal behavior.

92. The method or system of claim 67 or 68, wherein the condition includes an environmental condition.

93. The method or system of claim 67 or 68, wherein said pattern includes rising and subsiding of a prevalence of the behavior.

94. The method or system of claim 67 or 68, further including:
analyzing said changes for the presence of said pattern.

95. The method or system of claim 67 or 68, further comprising:
alerting a caretaker of said state in real time.

96. The method or system of claim 67 or 68, wherein said pattern includes a reoccurring behavior.

97. A method of estimating vitality of a flock of livestock comprising:

observing movements, including movements while the animal remains in one place, of each of a plurality of individuals in the flock;

quantifying said movements;

characterizing a respective vitality of each of said individuals from said energy output; and

extrapolating from said respective vitality characterizations to estimate the vitality of the flock.

98. A system for estimating vitality of a flock of livestock comprising:

a sensor configured for observing movements, including movements while the animal remains in one place, of each of a plurality of individuals in the flock , and

a computing and storage device configured for

quantifying said movements;

characterizing a respective vitality of each of said individuals from said energy output; and

extrapolating from said respective vitality characterizations to estimate the vitality of the flock.

99. The system or method of claim 97 or 98, wherein said quantifying includes estimating an energy expended.

100. The system or method of claim 97 or 98, wherein said estimating accounts for a state of said animal.

101. The system or method of claim 34, wherein state includes at least one status selected from the group consisting of a location with respect to a feeder, a location with respect to a water source, walking, sleeping, a time of day, an

environmental condition, a status of said plurality of individuals, and a status of the flock.

102. The system or method of claim 97 or 98, further comprising:

mounting a respective accelerometer on said each individual, and wherein said observing includes summing movements measured by said respective accelerometer.

103. The system or method of claim 97 or 98, further comprising:

monitoring a second behavior and wherein said characterizing is further based on said monitoring.

104. The system or method of claim 97 or 98, further comprising:

tracking a second behavior and wherein said characterizing is further based on said tracking.

105. A method of estimating vitality of a flock of livestock comprising:

delineate a virtual flock that is a subset of the flock;

characterize a health state of the virtual flock; and

extrapolate to the flock.

106. A system for estimating vitality of a flock of livestock comprising:

markings to delineate a virtual flock that is a subset of the flock, and

a computing and storage unit configured for:

characterizing a health state of the virtual flock; and

extrapolating to the flock.

107. The system or method of claim 105 or 106, further comprising:

identifying a vitality of said each individual in said virtual flock and wherein said characterizing is a result of said identifying.

108. The system or method of claim 105 or 106, further including,

alerting a caretaker of a condition, and wherein said alerting further includes informing the caretaker of at least one secondary aspect of the alert, said secondary aspect including at least one attribute selected from the list comprised of a certainty level of the alert, an acuteness level of the alert, and a potential severity level of the alert.

109. A method of estimating vitality of a flock of livestock comprising:

monitoring a characteristic of each of a group of individuals from the flock;

measuring a rate of change of each of said individuals with regard to said characteristic wherein said change is at least partially balanced off within the overall population; and

identifying a transmission of a pathology within the flock from a result of said measuring.

110. The system or method of any of claims 97, 98, 105 or 106 wherein said vitality is used to select an animal for breeding.

111. The system or method of any of claims 97, 98, 105 and 106 wherein said vitality is used for evaluating a health intervention.

112. The system or method of any of claims 97, 98, 105 and 106 wherein said vitality is used for comparing at least two groups of animals.

113. The system or method of any of claims 97, 98, 105 and 106 wherein said vitality is used for evaluating an environmental condition.

114. A method of estimating vitality of a flock of livestock comprising:

identifying a current state of each individual of a plurality of individuals making up a portion of the flock;

recording an observation of a respective individual of said individuals according to his current state;

characterizing a respective vitality of said respective individual according to said activity state and said recorded observation; and

extrapolating said health state of said plurality of individuals to estimate the vitality of the flock.

115. A system for estimating vitality of a flock of livestock comprising:

a sensor configured for identifying a current state of each individual of a plurality of individuals making up a portion of the flock; and

a computing and storage unit configured for:

recording an observation of a respective individual of said individuals according to his current state;

characterizing a respective vitality of said respective individual according to said activity state and said recorded observation; and

extrapolating said health state of said plurality of individuals to estimate the vitality of the flock.

116. The system or method of claim 114 or 115 further comprising:

identifying a vitality of said each individual from a result of said characterizing.

117. The system or method of claim 114 or 115, wherein said characterizing is based on an accelerometer output.

118. The system or method of claim 114 or 115, further comprising:

evaluating an environmental condition based on said characterizing.

119. The system or method of claim 114 or 115, further comprising:

selecting an animal for breeding based on said characterizing.

120. The system or method of claim 114 or 115, further comprising:

evaluating the effect of a health intervention based on said characterizing.

121. The system or method of claim 114 or 115, further comprising:

comparing at least two groups of animals based on said characterizing.

FIG. 1

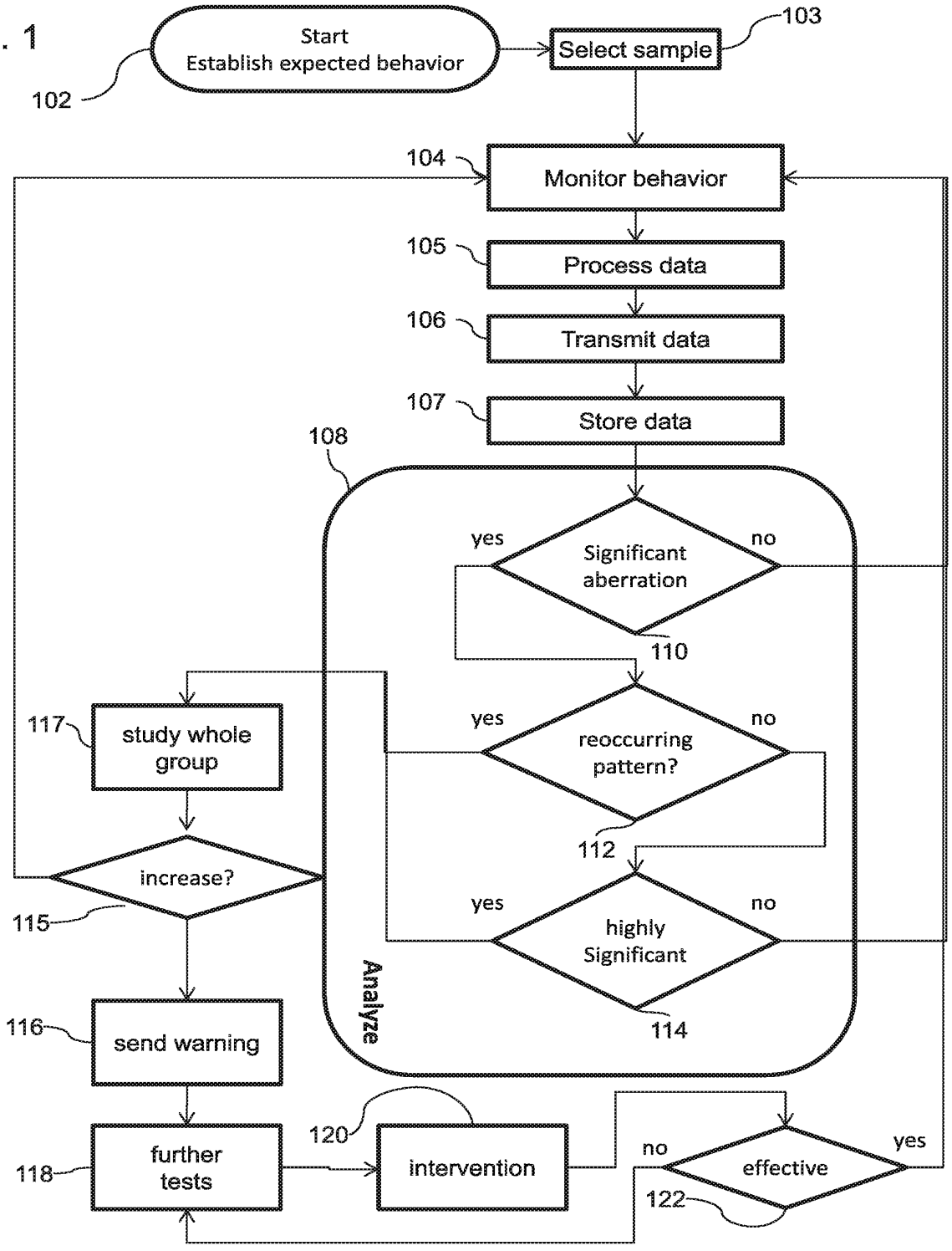

Start
Establish expected behavior
102
Select sample
103
Monitor behavior
104
Process data
105
Transmit data
106
Store data
107
108
Analyze
Significant aberration
yes
no
110
reoccurring pattern?
yes
no
112
highly Significant
yes
no
114
increase?
115
study whole group
117
send warning
116
further tests
118
intervention
120
effective
no
yes
122

FIG. 2

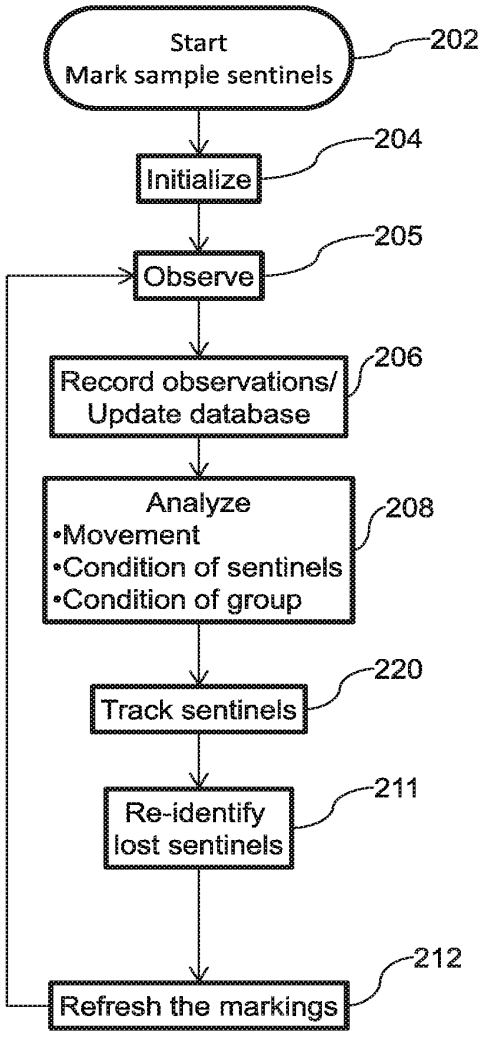

Start
Mark sample sentinels
202
200
Initialize
204
Observe
205
Record observations/
Update database
206
Analyze
•Movement
•Condition of sentinels
•Condition of group
208
Track sentinels
220
Re-identify
lost sentinels
211
Refresh the markings
212

FIG. 3A

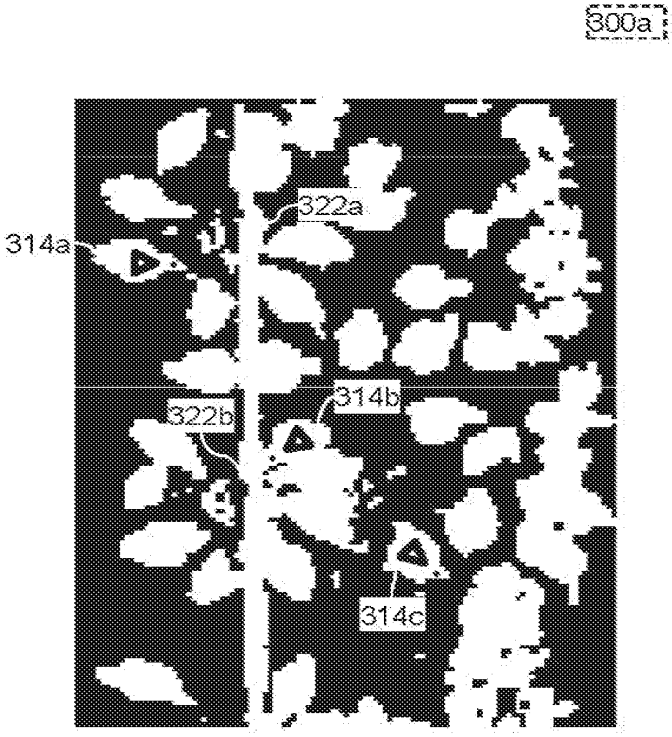

300a
322a
314a
322b
314b
314c

FIG. 3B


300a
316b
318b
314b
322b
316c
318c
314c

FIG. 3C

300b

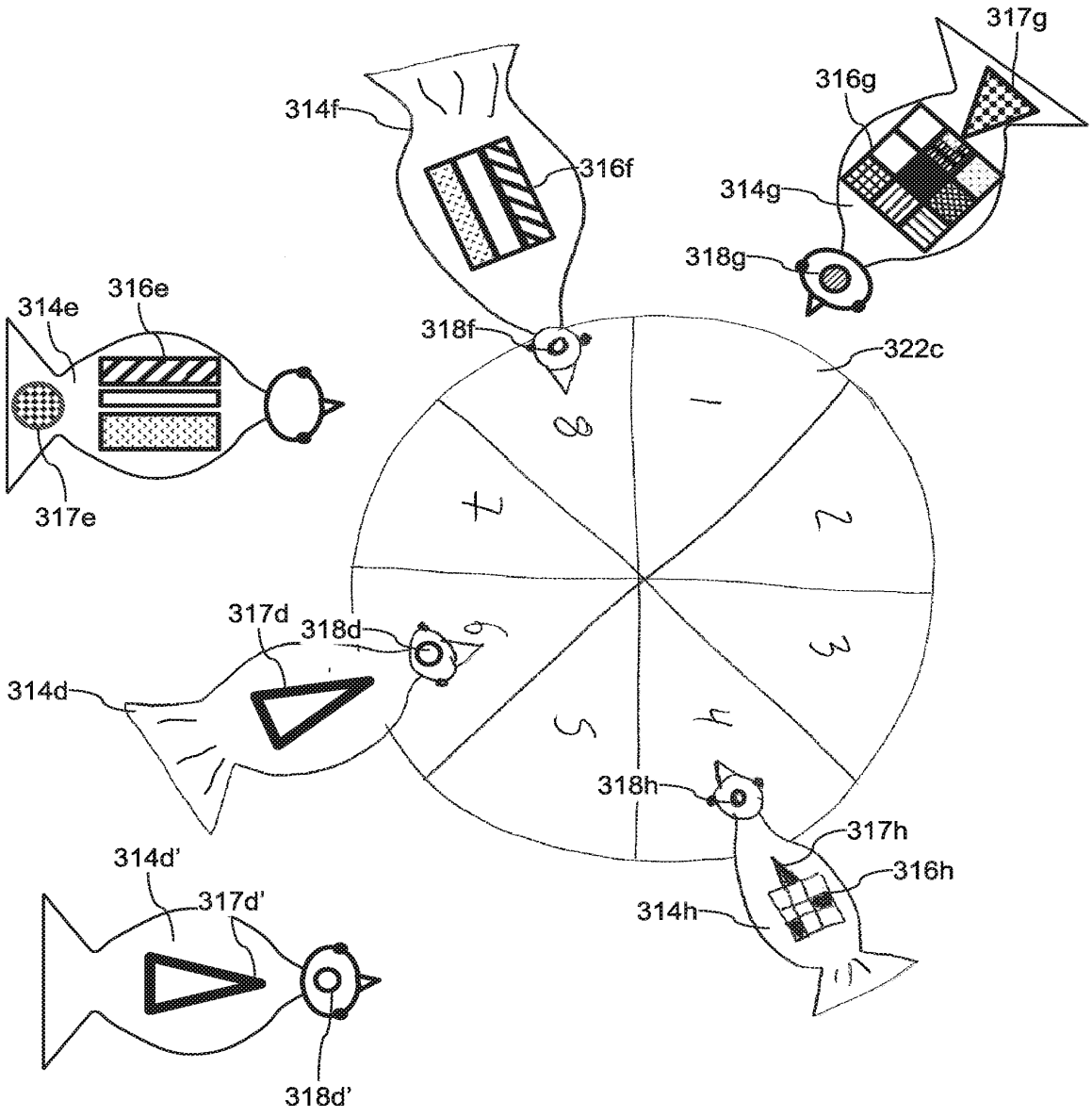

317g
316g
314f
316f
314g
318g
314e
316e
318f
322c
318d
317d
314d
318h
317h
316h
314h
314d'
317d'
318d'

FIG. 4

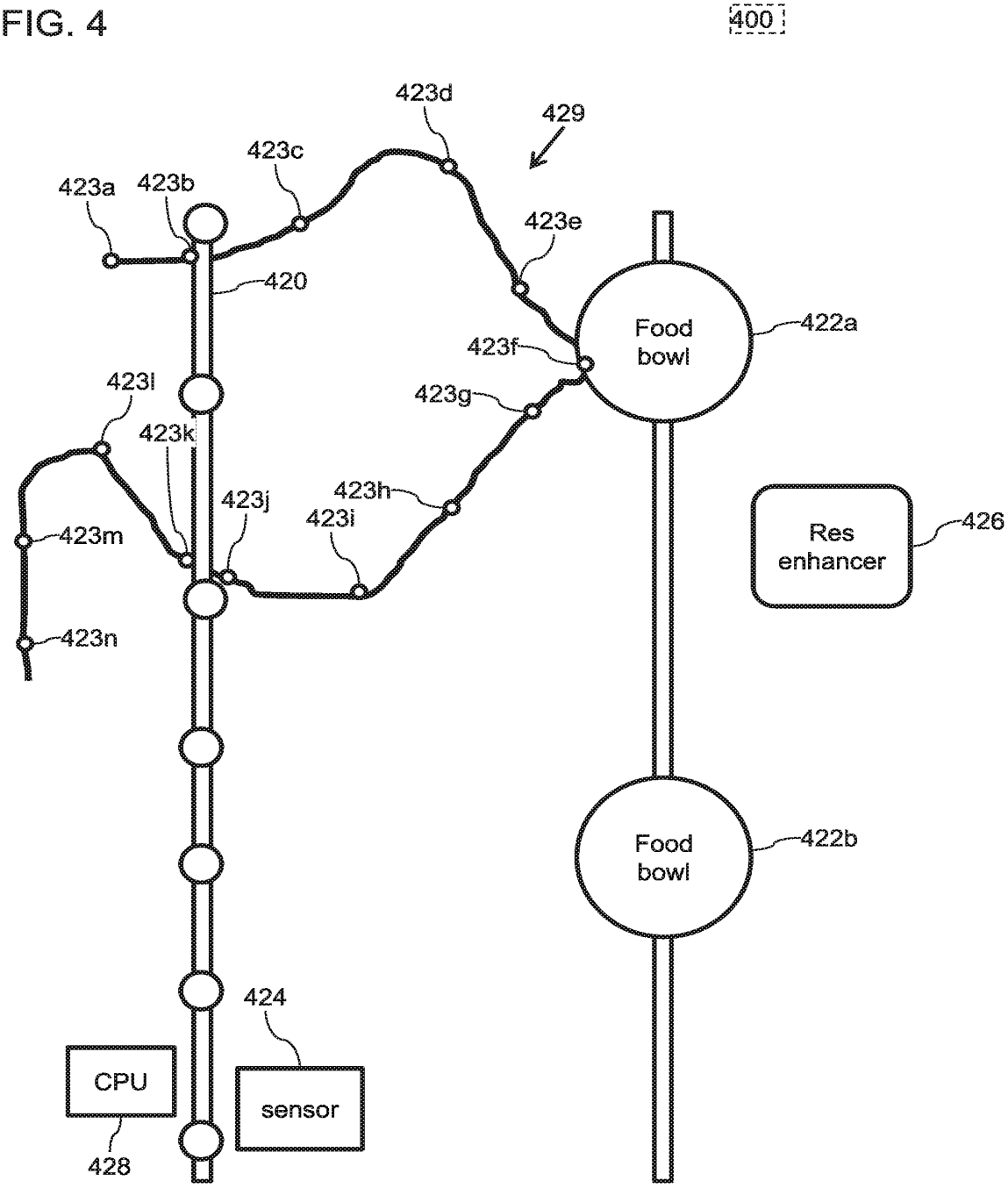

400
423d
429
423c
423a
423b
423e
420
Food bowl
422a
423f
423l
423g
423k
423h
423j
423i
423m
Res enhancer
426
423n
Food bowl
422b
424
CPU
sensor
428

FIG. 5A

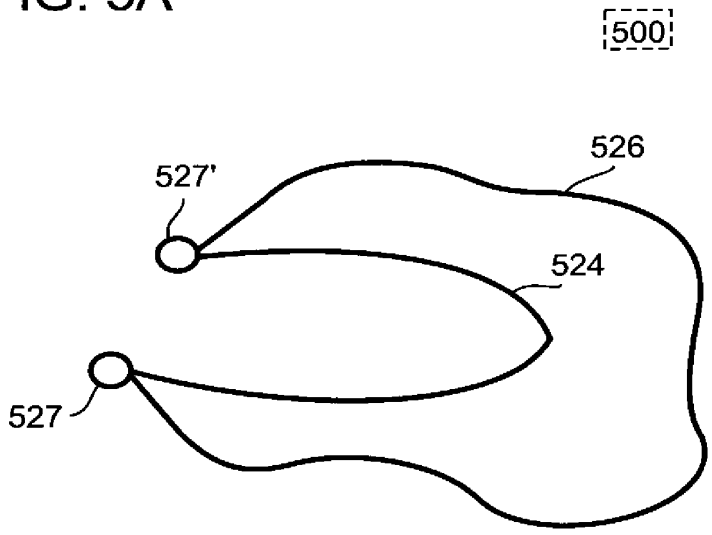


FIG. 5B

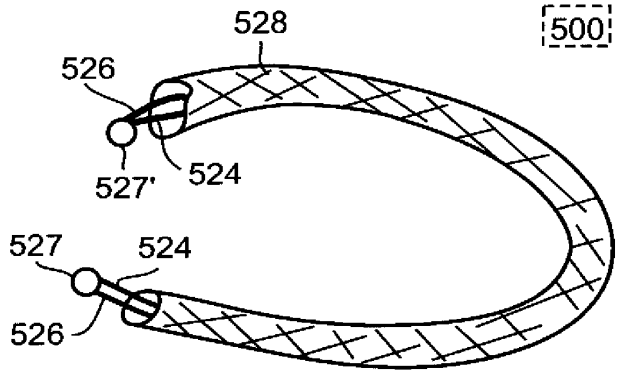


FIG. 6A

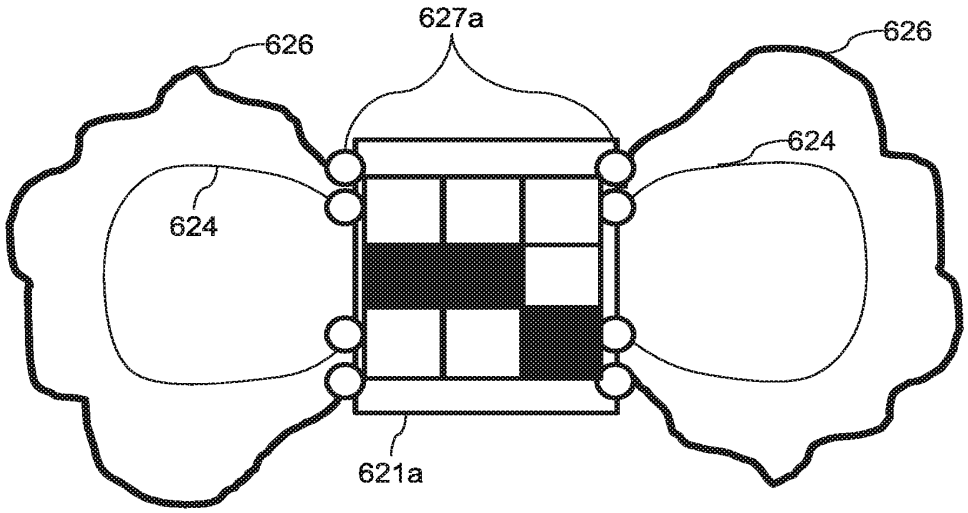


FIG. 6B

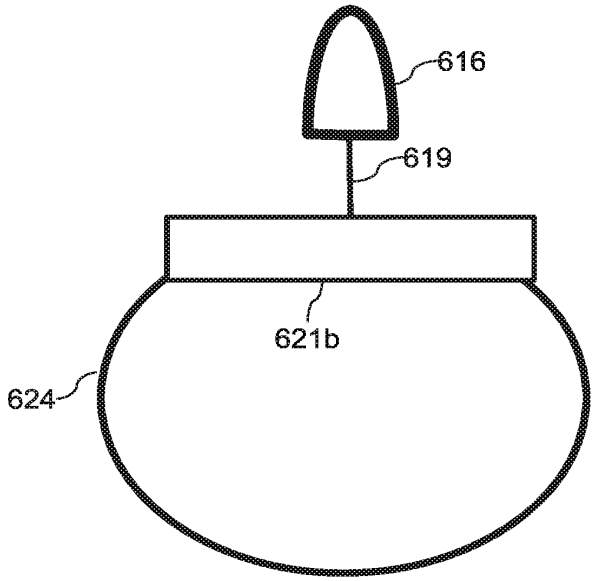


FIG. 6C

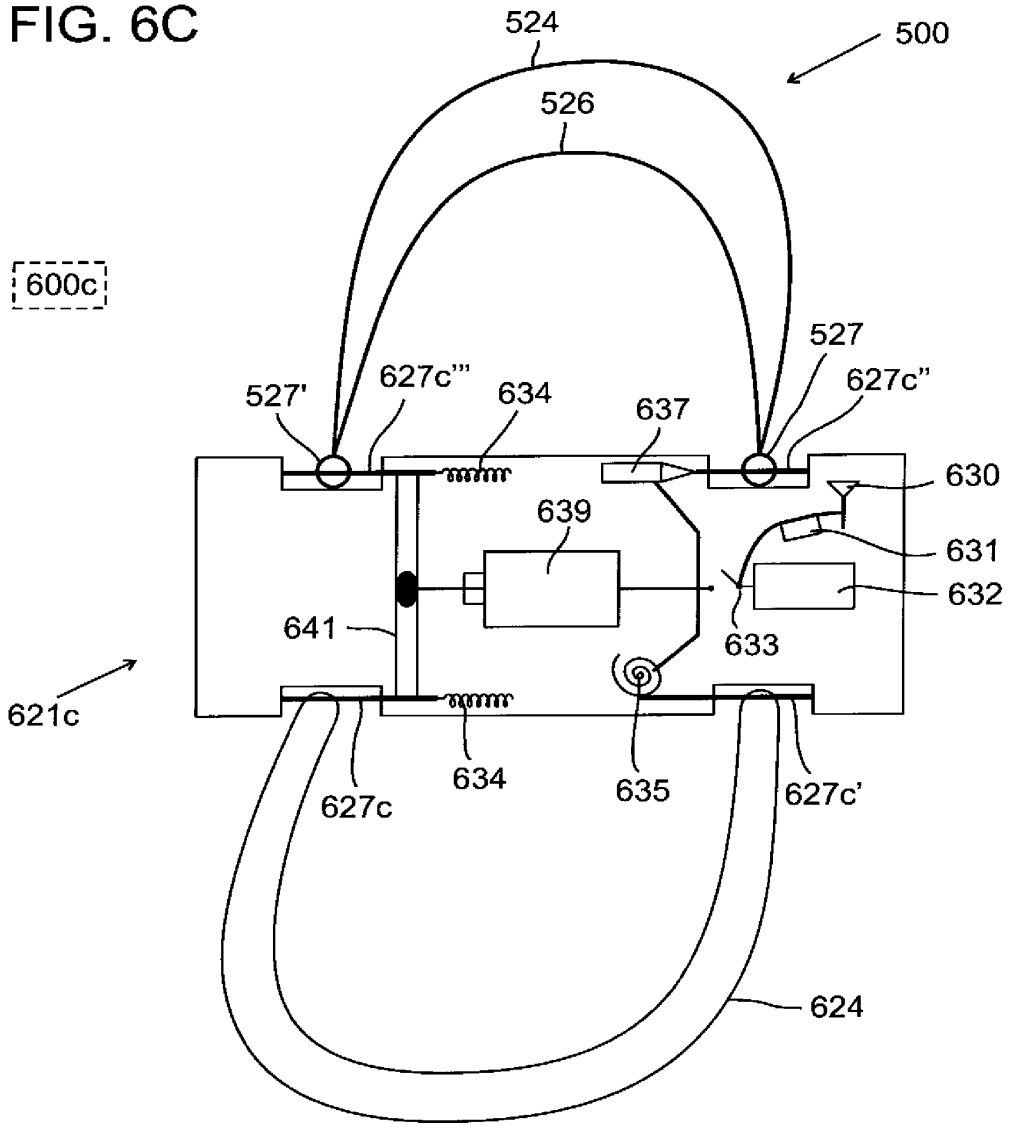

524
500
526
600c
527
627c'''
527'
634
637
627c''
630
639
631
632
641
633
621c
634
635
627c
627c'
624

FIG. 7

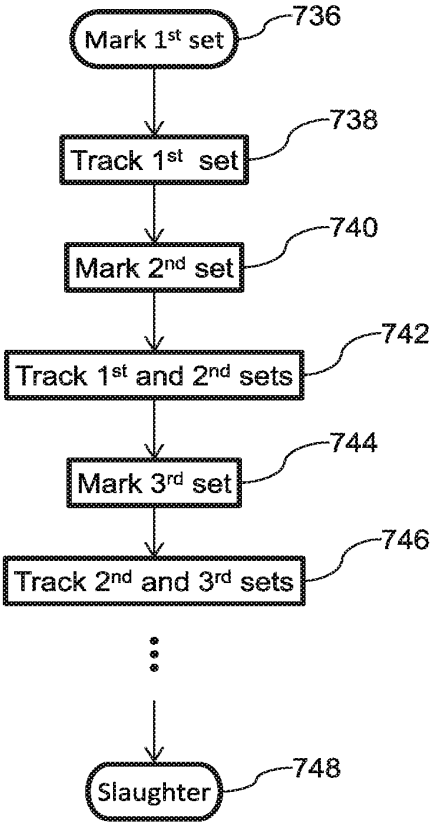

Mark 1st set
736
Track 1st set
738
Mark 2nd set
740
Track 1st and 2nd sets
742
Mark 3rd set
744
Track 2nd and 3rd sets
746
Slaughter
748

FIG. 8

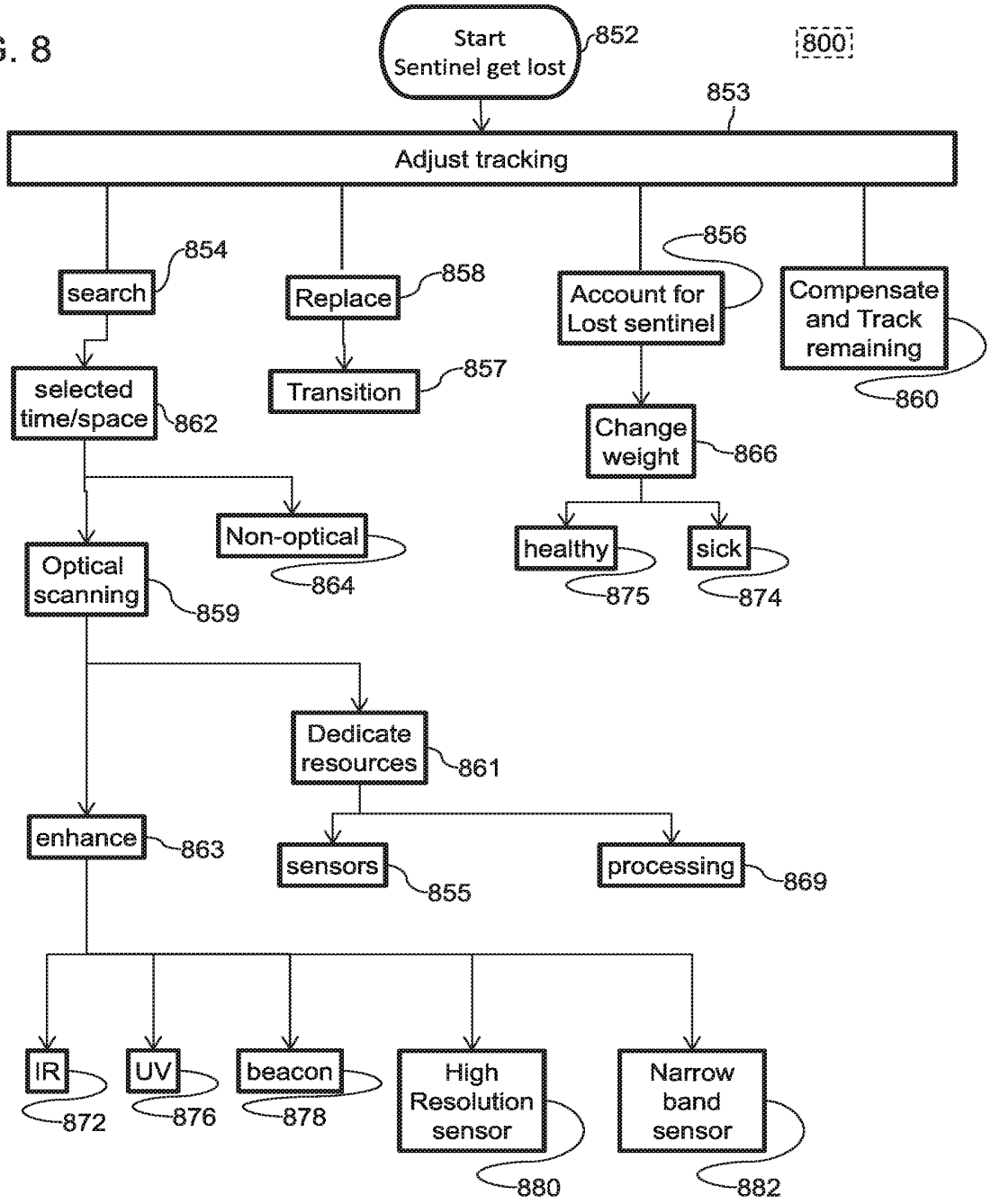

Start
Sentinel get lost
852
800
853
Adjust tracking
search
854
Replace
858
Account for
Lost sentinel
856
Compensate
and Track
remaining
860
selected
time/space
862
Transition
857
Change
weight
866
Non-optical
864
healthy
875
sick
874
Optical
scanning
859
Dedicate
resources
861
enhance
863
sensors
855
processing
869
IR
872
UV
876
beacon
878
High
Resolution
sensor
880
Narrow
band
sensor
882

FIG. 9

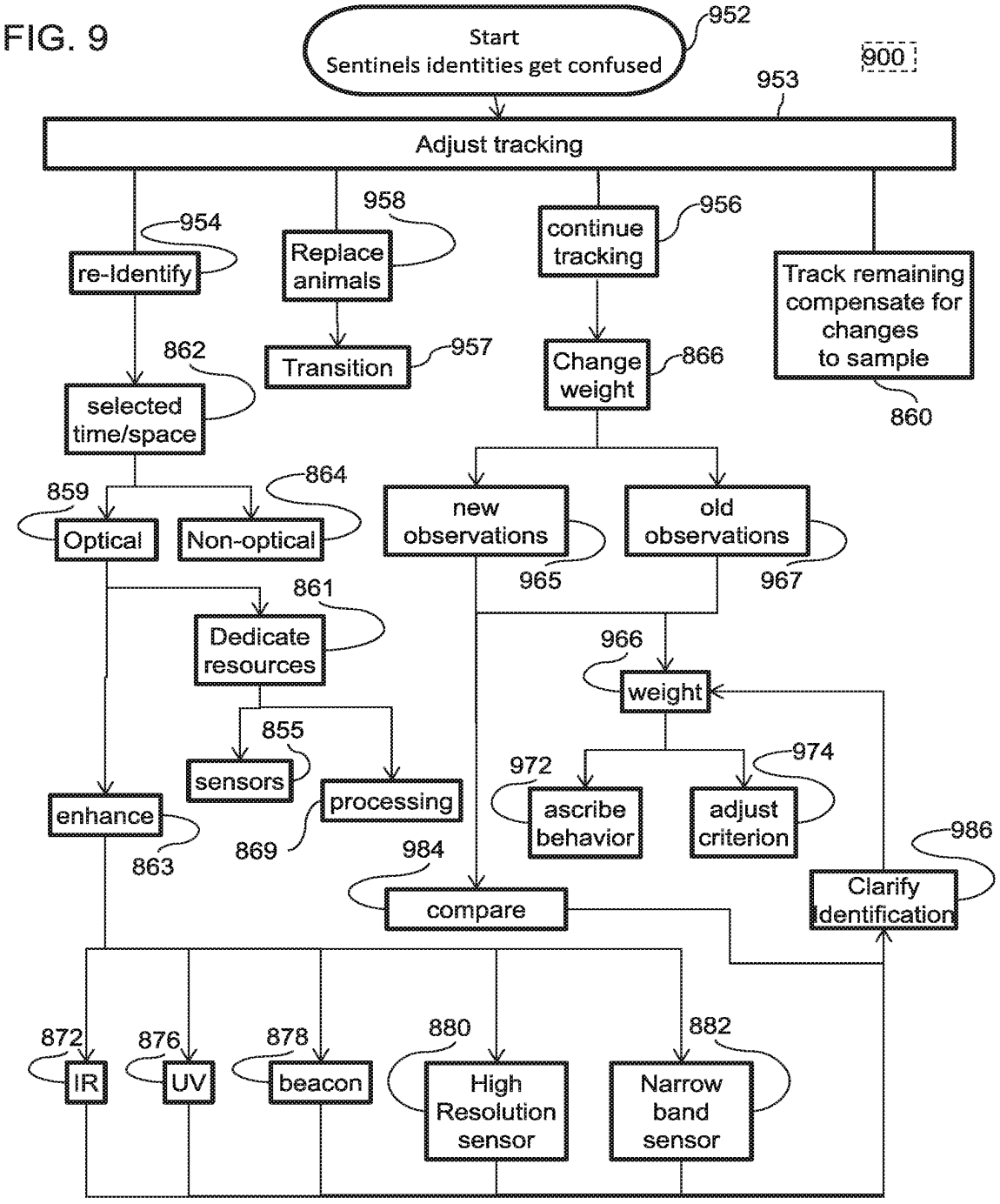

Start
Sentinels identities get confused
952
900
953
Adjust tracking
954
re-Identify
958
Replace animals
956
continue tracking
Track remaining compensate for changes to sample
860
862
selected time/space
Transition
957
Change weight
866
859
Optical
864
Non-optical
new observations
965
old observations
967
861
Dedicate resources
966
weight
855
sensors
processing
869
enhance
863
972
ascribe behavior
974
adjust criterion
986
Clarify identification
984
compare
872
IR
876
UV
878
beacon
880
High Resolution sensor
882
Narrow band sensor

FIG. 10

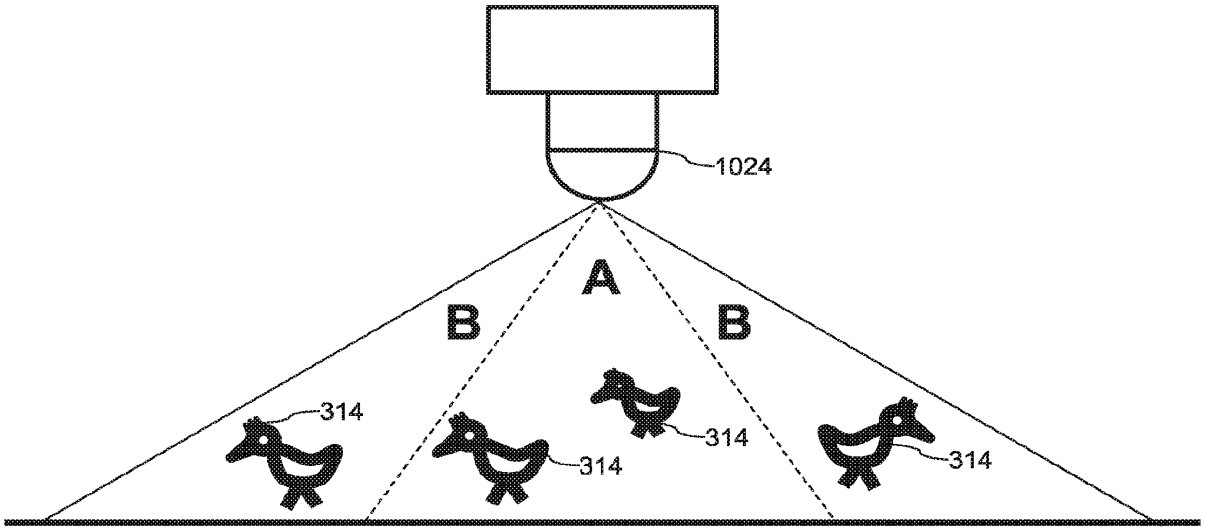
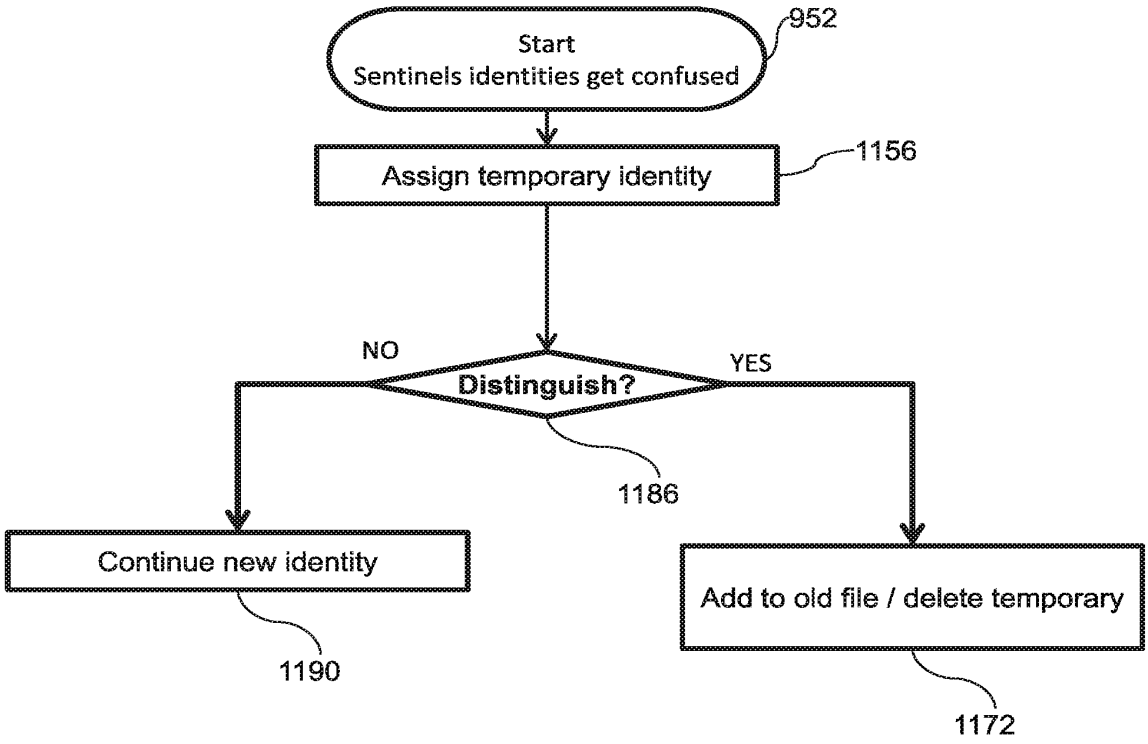


FIG. 11


Start
Sentinels identities get confused
952
Assign temporary identity
1156
NO
Distinguish?
YES
1186
Continue new identity
1190
Add to old file / delete temporary
1172

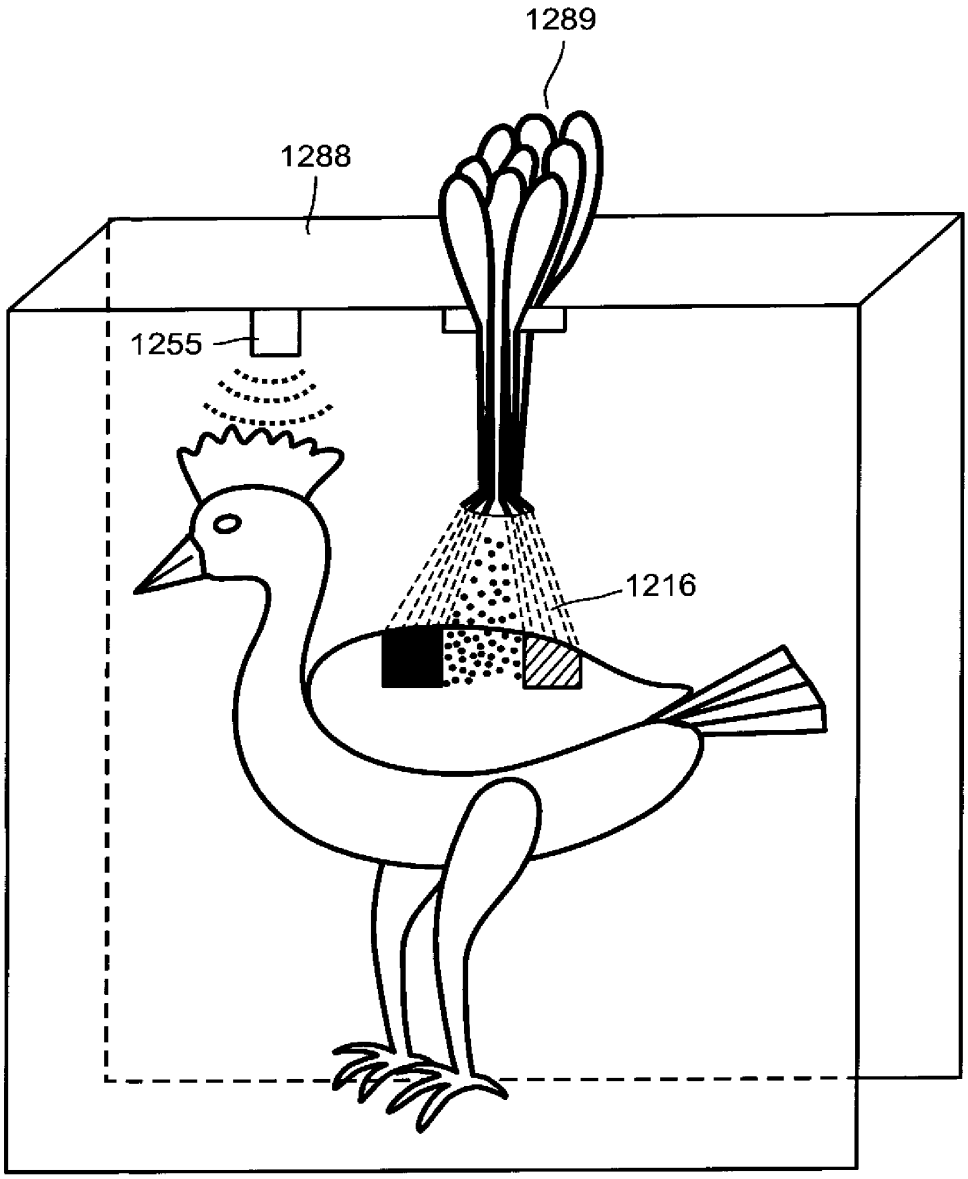
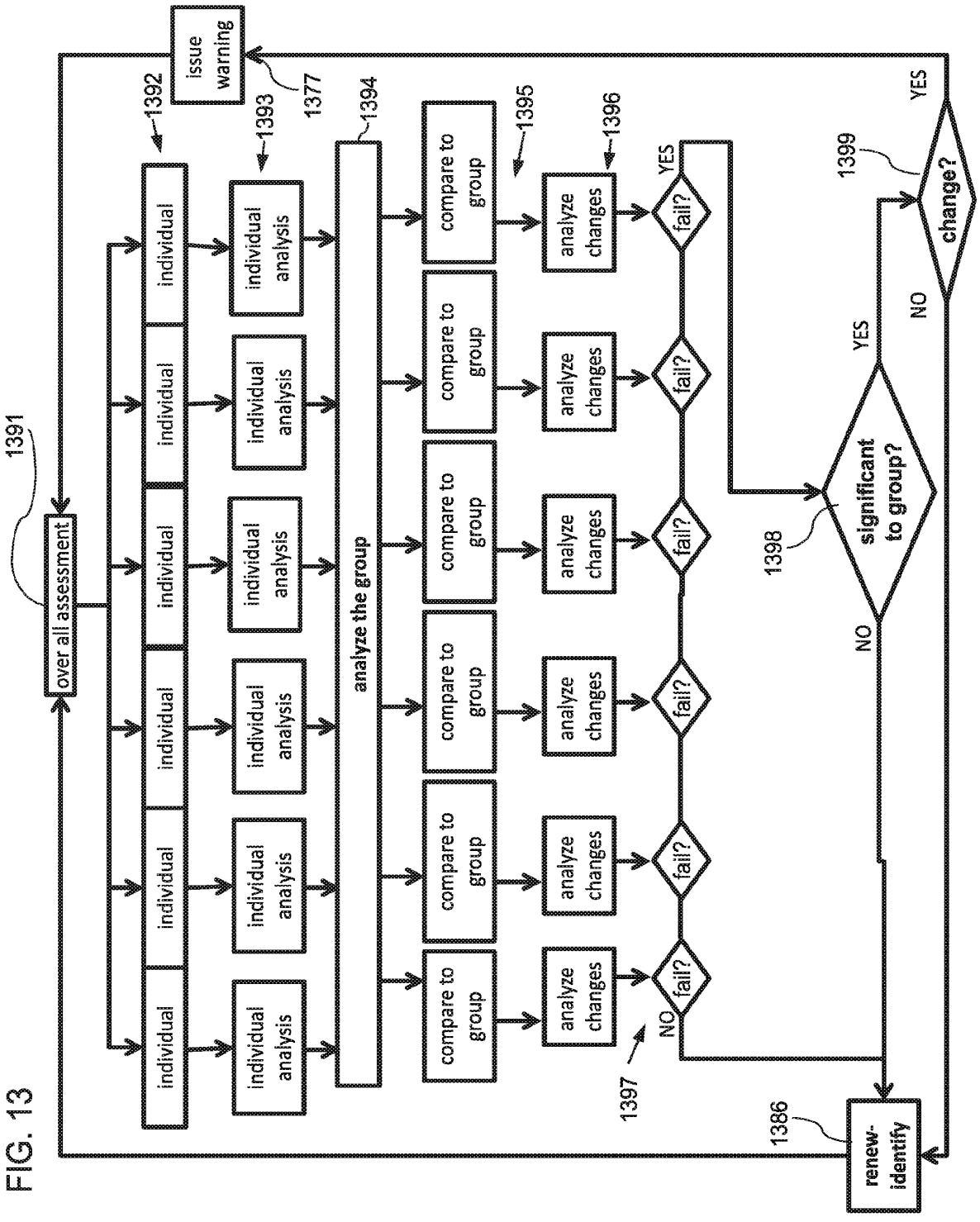


FIG. 12

FIG. 13


1391
over all assessment
individual
individual analysis
1392
1393
1377
issue warning
1394
analyze the group
compare to group
1395
analyze changes
1396
fail?
YES
NO
1397
1398
significant to group?
1399
change?
1386
renew-identify

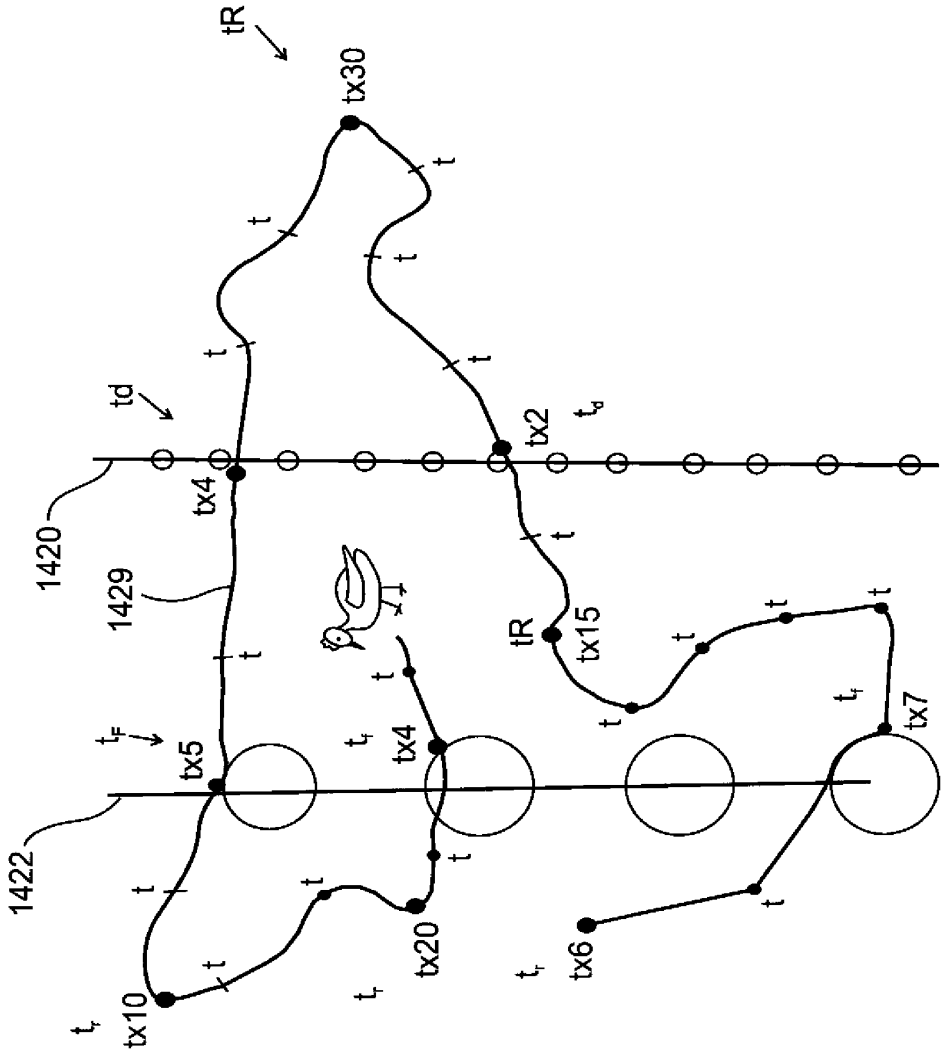

tR
tx30
td
tx2
tx4
1420
1429
1422
tR
tx15
tx5
tx4
tx7
tx20
tx6
tx10

FIG. 14

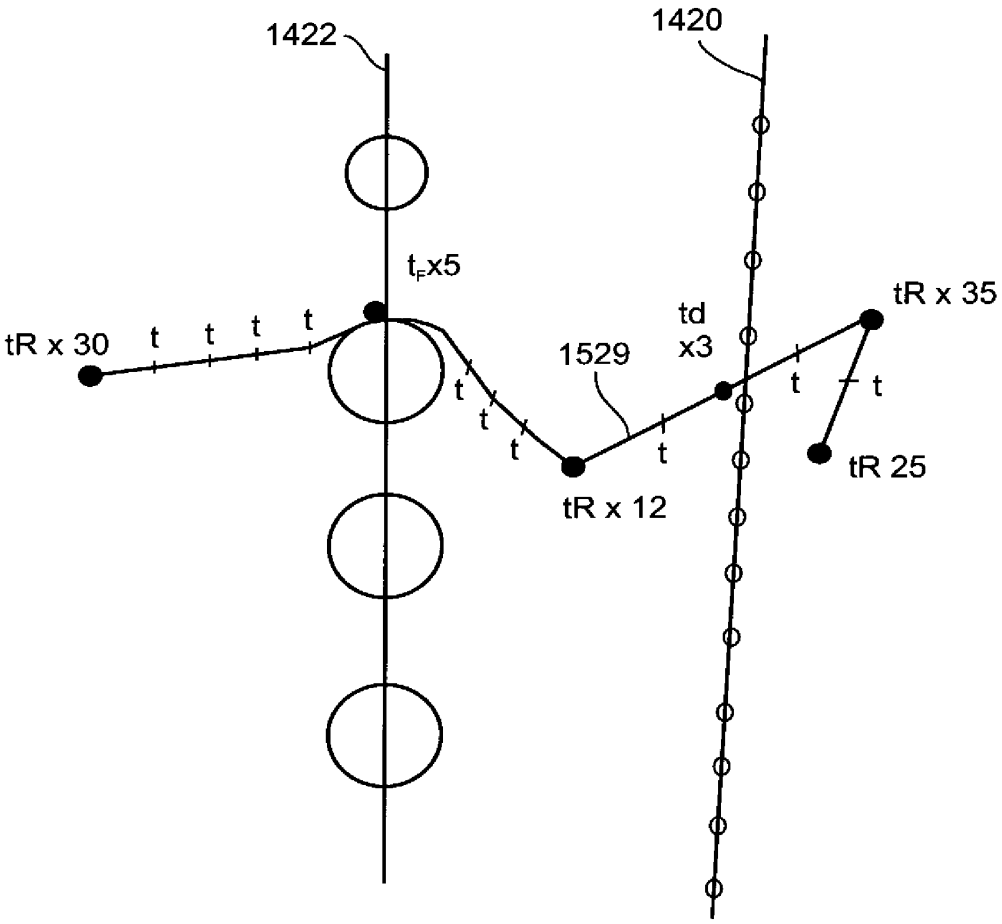


FIG. 15

FIG. 16A

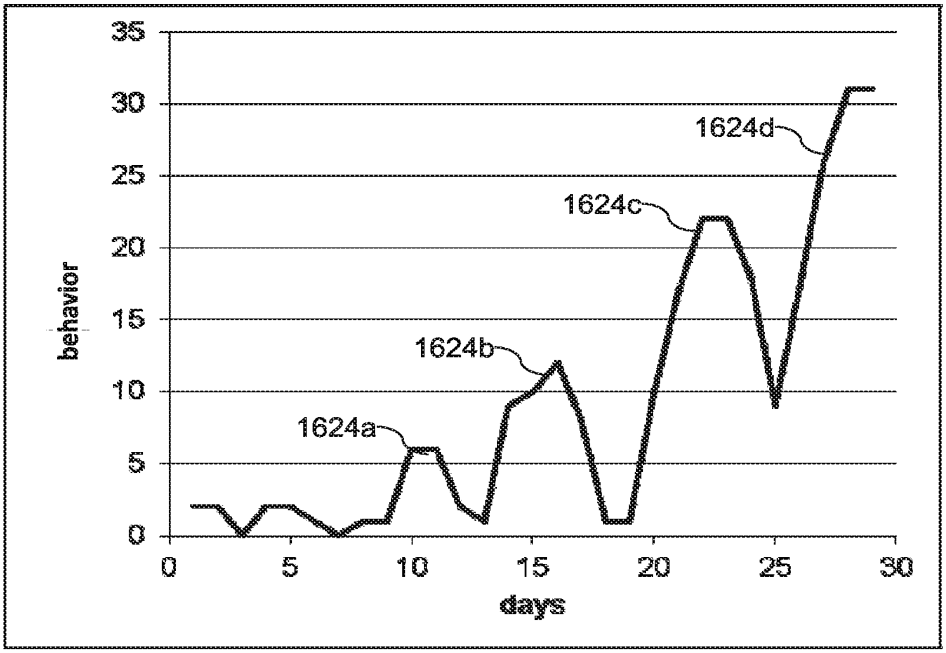


FIG. 16B

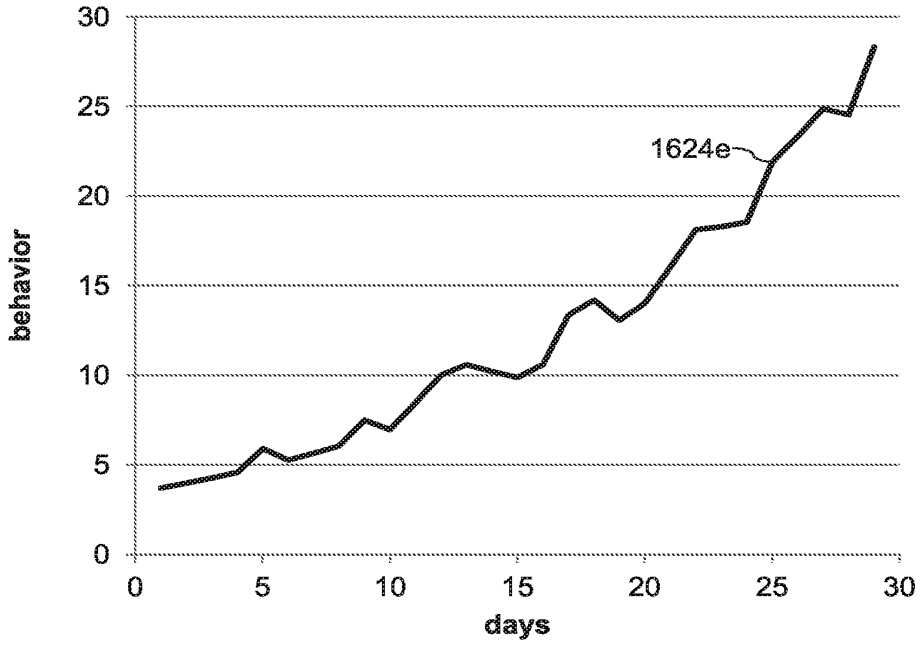


FIG. 17A

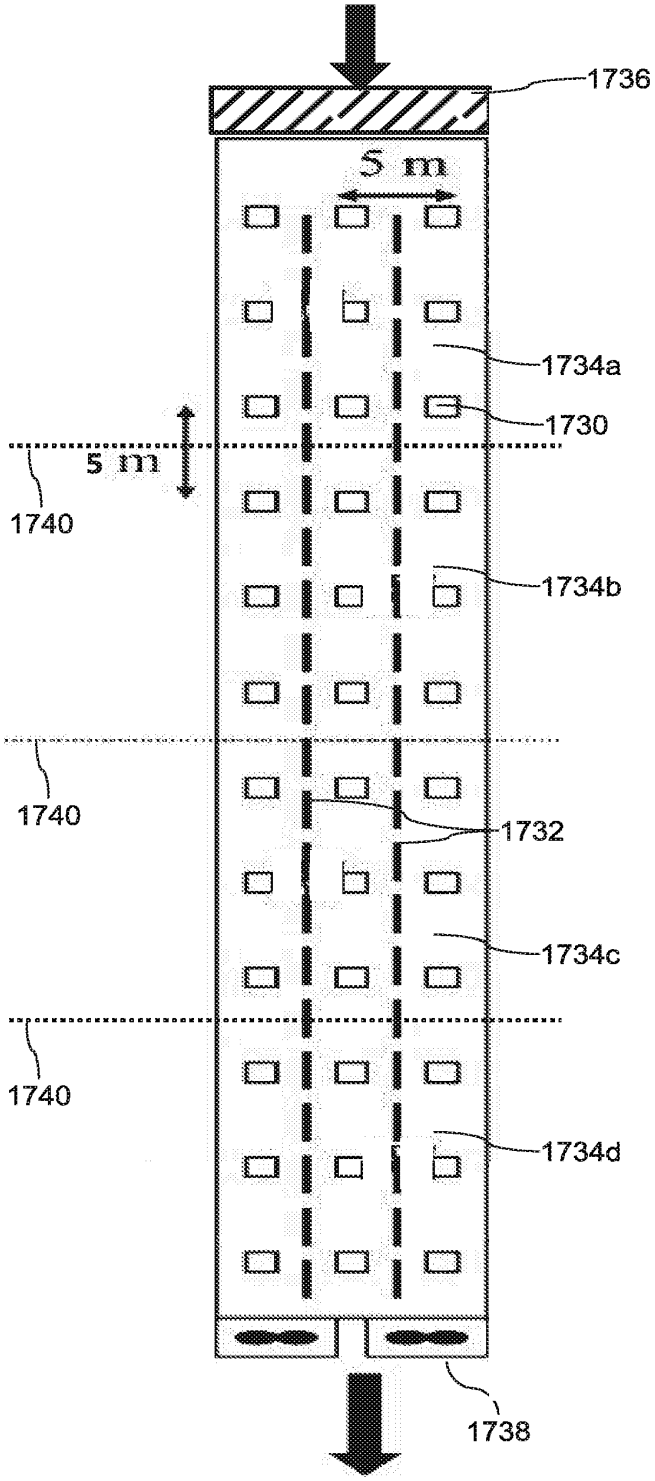

1736
5 m
1734a
1730
5 m
1740
1734b
1740
1732
1734c
1740
1734d
1738

FIG. 17B

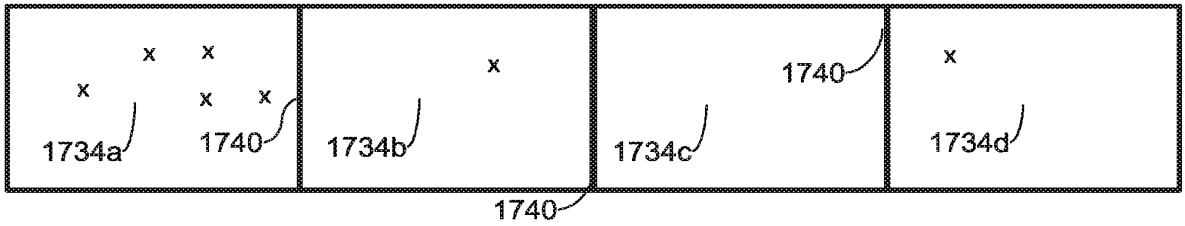


FIG. 17C

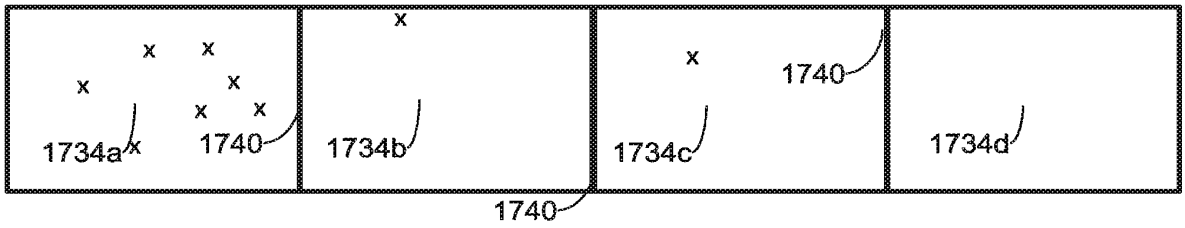


FIG. 17D

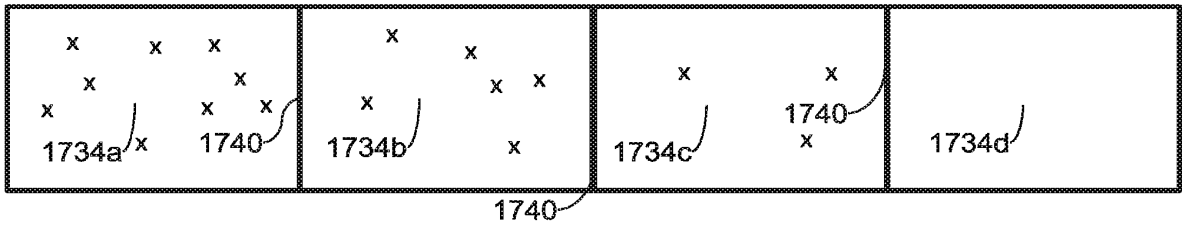


FIG. 17E

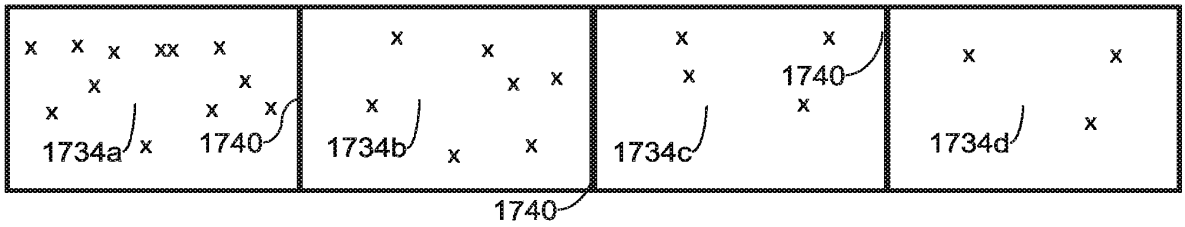


FIG. 18A

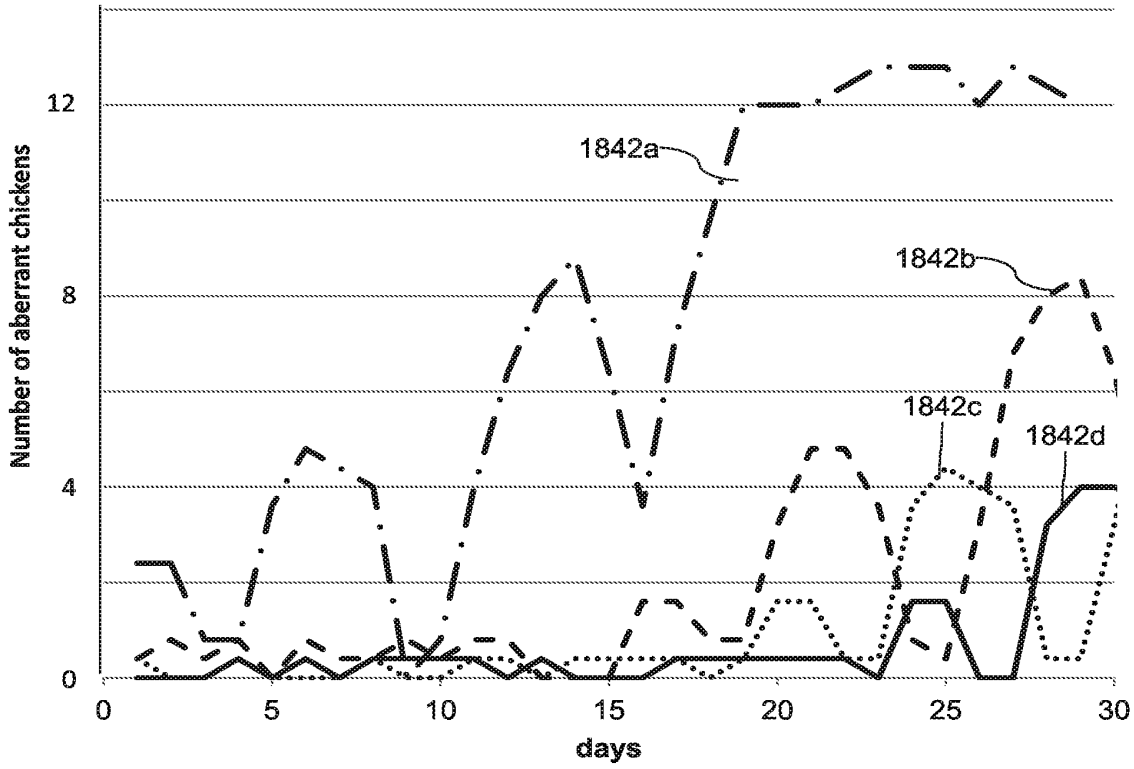

Number of aberrant chickens
12
8
4
0
0
5
10
15
20
25
30
days
1842a
1842b
1842c
1842d

FIG. 18B

Days	Virulence	Speed	Spread	Persistence	Certain	Danger
6	1	1	0	0	0	4
14	1	1	0	1	0	5
15	1	1	1	1	1	6
19	1	1	1	1	1	6
21	1	1	2	1	2	7
27	1	1	2	2	4	8

certainty = spread × lasting
danger = (2 × virulence) + speed + spread + lasting + (speed × virulence)

FIG. 18C

days	acuteness	contagiousness	locality	portion affected	recovery	certainty	danger
25	2	2	1	1%	0	30%	1
28	3	3	1	2%	0.5%	40%	1
31	3	4	2	4%	1%	50%	2
34	3	5	4	8%	2%	85%	5

FIG. 19

Time (seconds)	X Acceleration (g)	Y Acceleration (g)	Z Acceleration (g)	x-area x 100	y-area x 100	z-area x 100	x length	y length	z length	x Delta	y Delta	z Delta
0.26	-0.047	0.234	0.984									
0.83	-0.094	0.281	0.984	1.33	1.33	0.00	0.57	0.57	0.57	0.05	0.05	0.00
0.99	-0.047	0.516	0.797	0.39	1.95	1.56	0.17	0.29	0.25	0.05	0.23	0.19
1.03	0.141	-0.047	0.984	0.32	0.96	0.32	0.19	0.56	0.19	0.19	0.56	0.19
1.06	-0.047	0.188	1.078	0.31	0.39	0.15	0.19	0.24	0.10	0.19	0.23	0.09
1.46	-0.094	0.281	0.938	0.94	1.88	2.81	0.40	0.41	0.42	0.05	0.09	0.14
1.86	0.000	0.281	0.938	1.88	0.00	0.00	0.41	0.40	0.40	0.09	0.00	0.00
1.89	-0.234	0.234	0.984	0.39	0.08	0.08	0.24	0.06	0.06	0.23	0.05	0.05
1.96	0.000	0.281	0.984	0.79	0.16	0.00	0.24	0.08	0.07	0.23	0.05	0.00
2.23	-0.234	0.188	0.984	3.13	1.25	0.00	0.36	0.28	0.27	0.23	0.09	0.00
2.26	-0.047	0.234	0.984	0.31	0.08	0.00	0.19	0.06	0.03	0.19	0.05	0.00
2.56	0.141	0.281	0.984	2.81	0.70	0.00	0.35	0.30	0.30	0.19	0.05	0.00
2.59	0.047	0.469	0.938	0.15	0.31	0.08	0.10	0.19	0.06	0.09	0.19	0.05
2.66	0.141	0.234	0.938	0.31	0.79	0.00	0.12	0.24	0.07	0.09	0.23	0.00
3.06	0.141	0.328	0.891	0.00	1.88	0.94	0.40	0.41	0.40	0.00	0.09	0.05
3.19	0.234	0.422	1.078	0.62	0.62	1.25	0.16	0.16	0.23	0.09	0.09	0.19
3.26	-0.047	0.422	0.891	0.94	0.00	0.63	0.29	0.07	0.20	0.28	0.00	0.19
3.29	0.234	0.281	0.984	0.46	0.23	0.15	0.28	0.14	0.10	0.28	0.14	0.09
3.42	0.047	0.375	0.938	1.25	0.62	0.31	0.23	0.16	0.14	0.19	0.09	0.05
3.82	0.094	0.328	0.938	0.94	0.94	0.00	0.40	0.40	0.40	0.05	0.05	0.00
4.06	0.141	0.281	1.172	0.55	0.55	2.74	0.24	0.24	0.33	0.05	0.05	0.23
			TOTALS	17.81	14.69	11.02	5.54	5.27	4.58	2.81	2.39	1.50

FIG. 20A

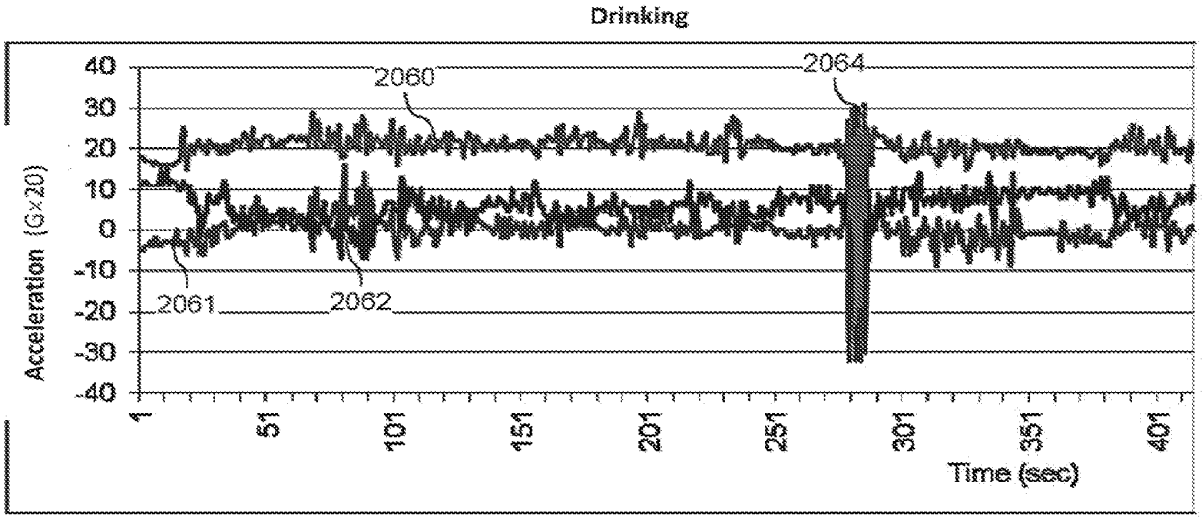


FIG. 20B

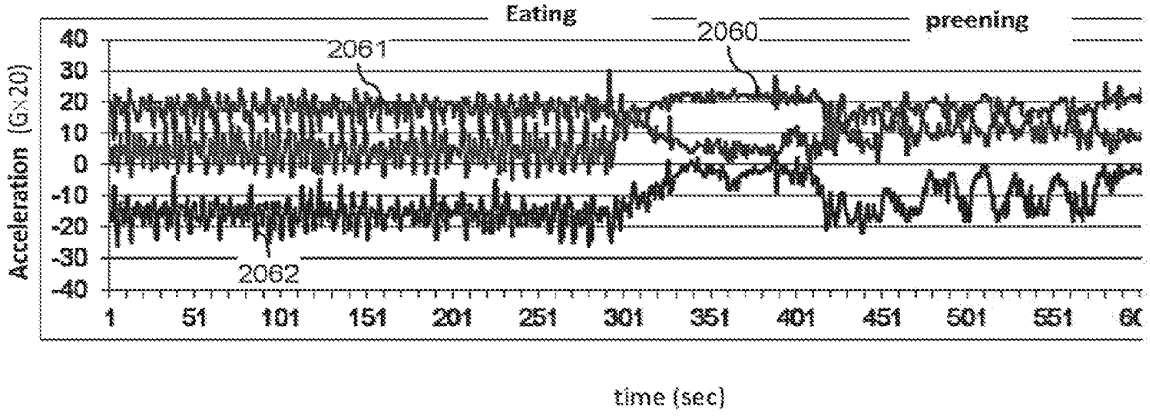


FIG. 20C

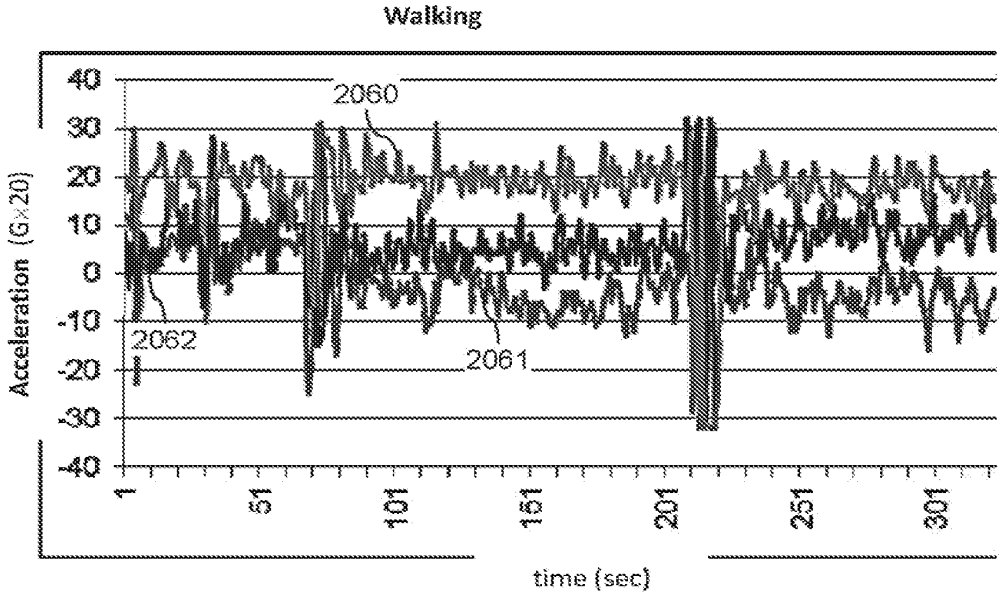
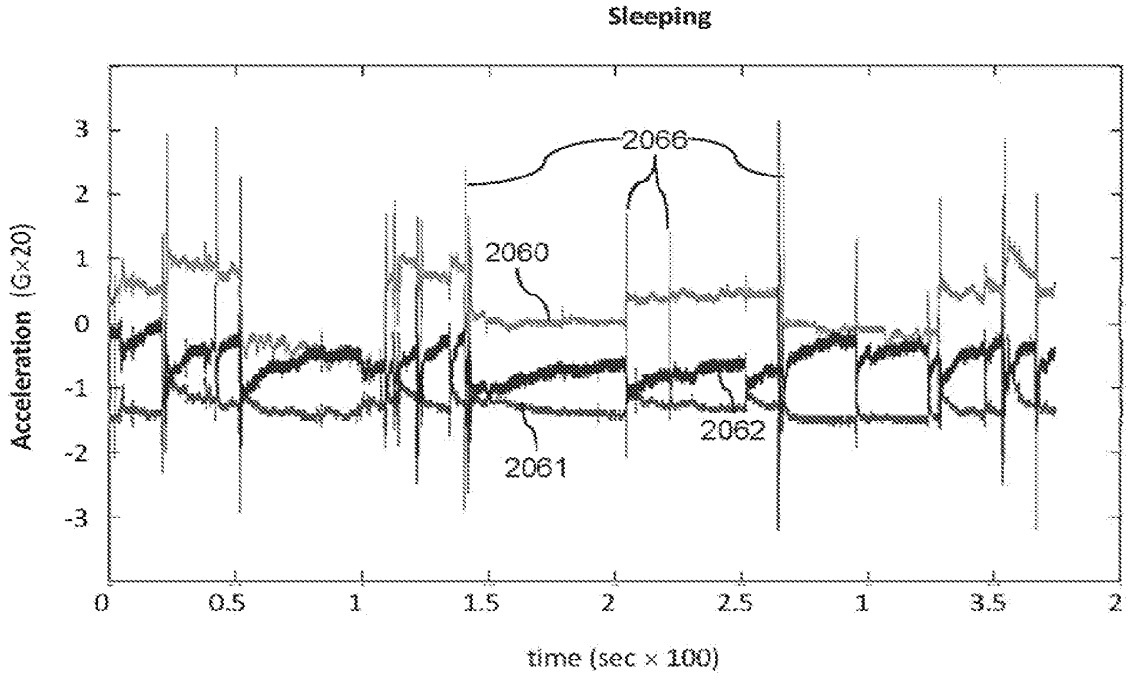


FIG. 20D



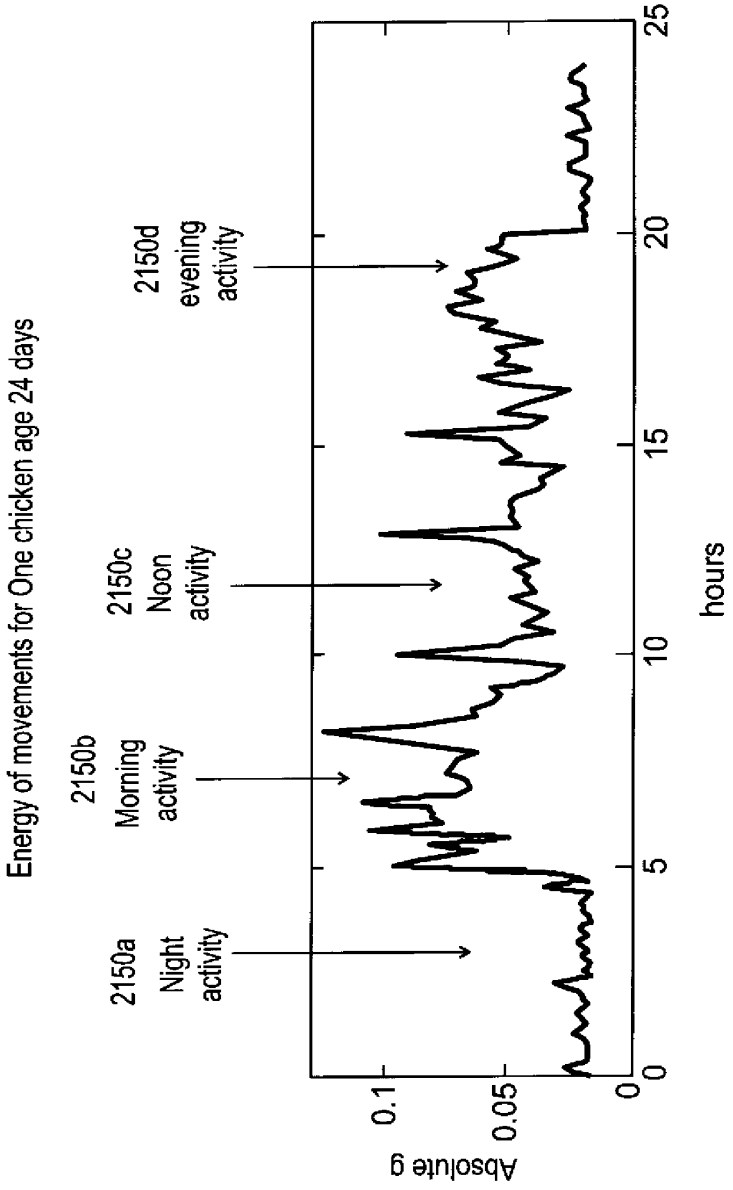

Energy of movements for One chicken age 24 days
2150a
Night
activity
2150b
Morning
activity
2150c
Noon
activity
2150d
evening
activity
Absolute g
0
0.05
0.1
0
5
10
15
20
25
hours

FIG. 21

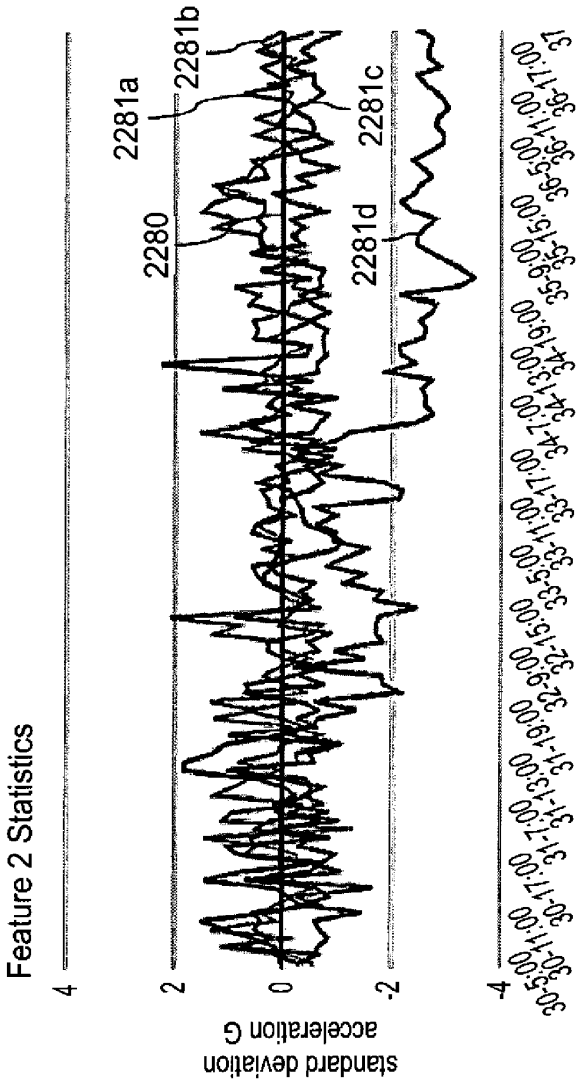

Feature 2 Statistics
standard deviation
acceleration G
age
2280
2281a
2281b
2281c
2281d
4
2
0
-2
-4

FIG. 22A

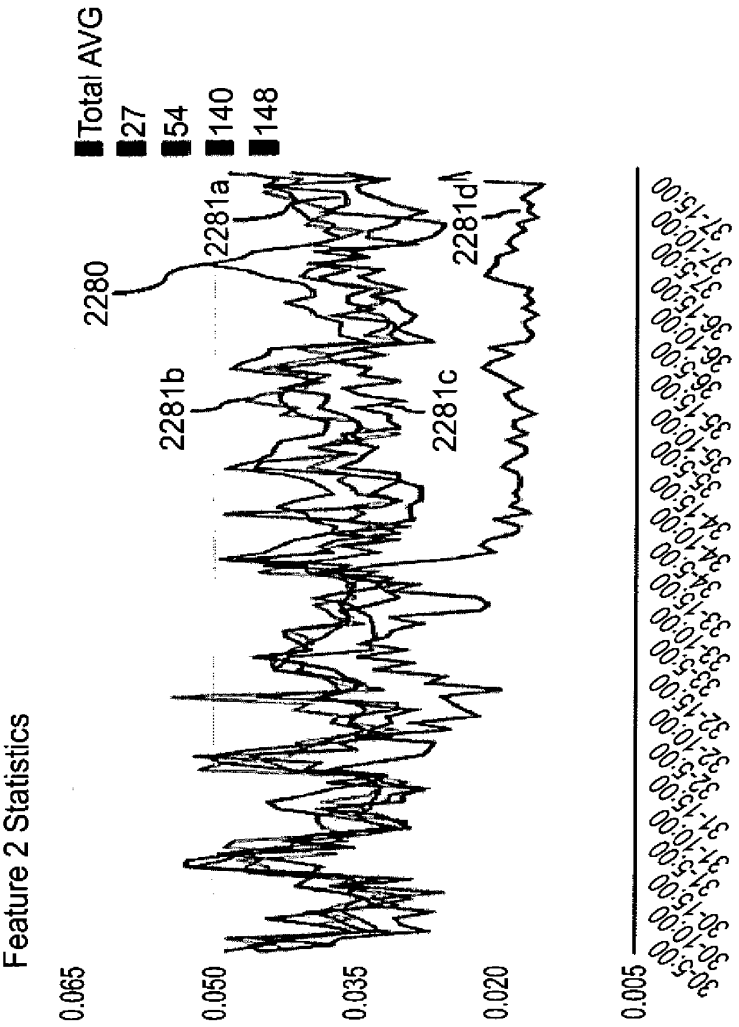

Feature 2 Statistics
0.065
0.050
0.035
0.020
0.005
Total AVG
27
54
140
148
2280
2281a
2281b
2281c
2281d

FIG. 22B

FIG. 23A

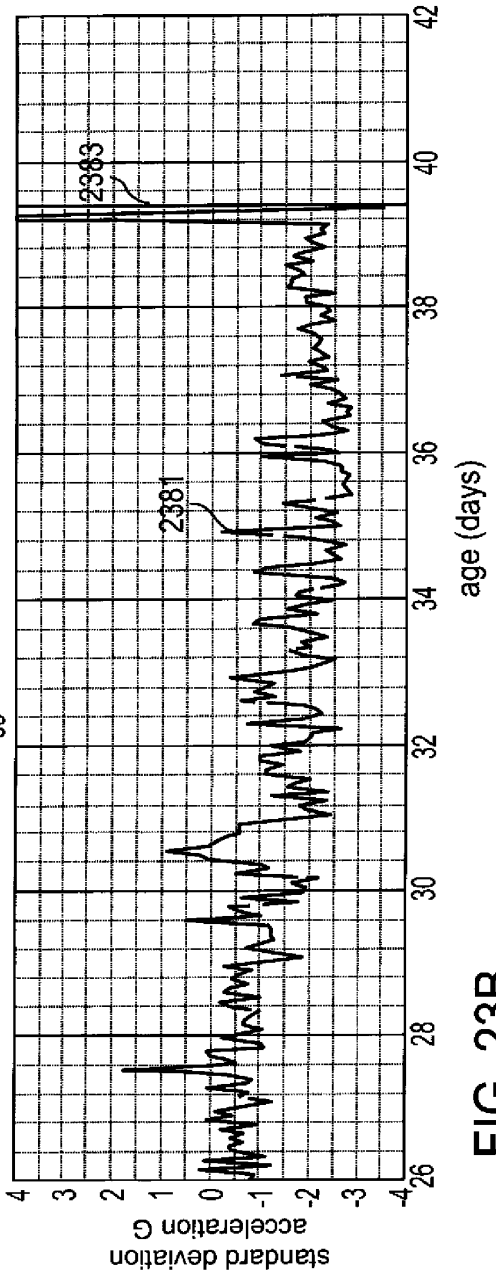


FIG. 23B

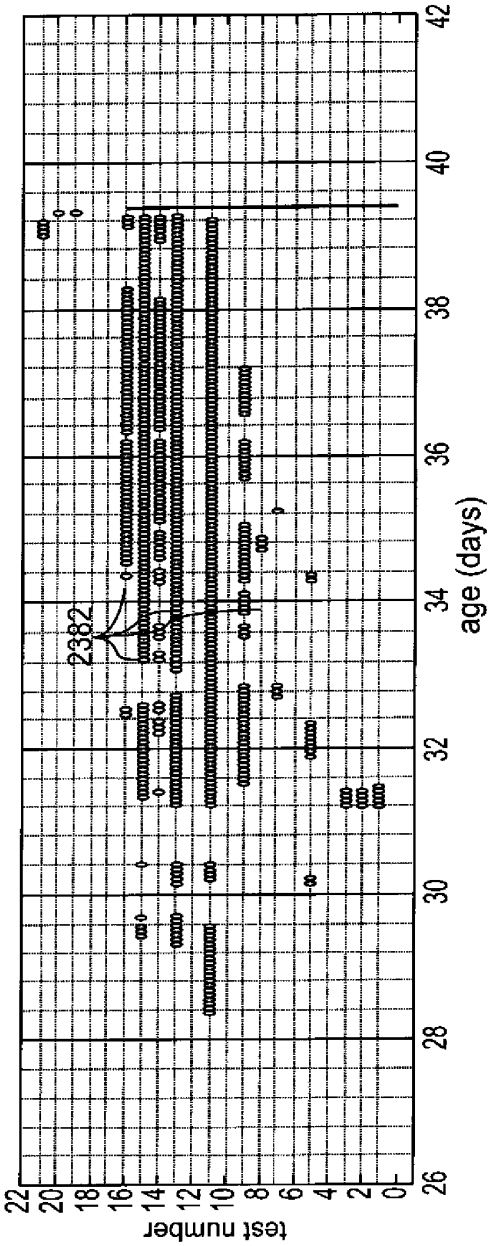


FIG. 24A

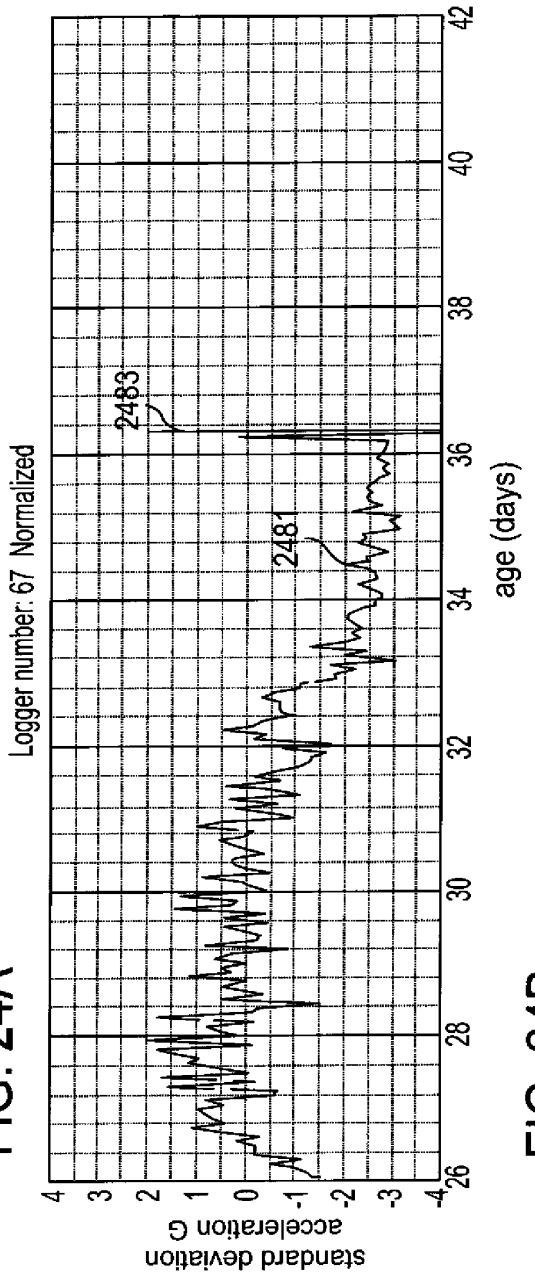
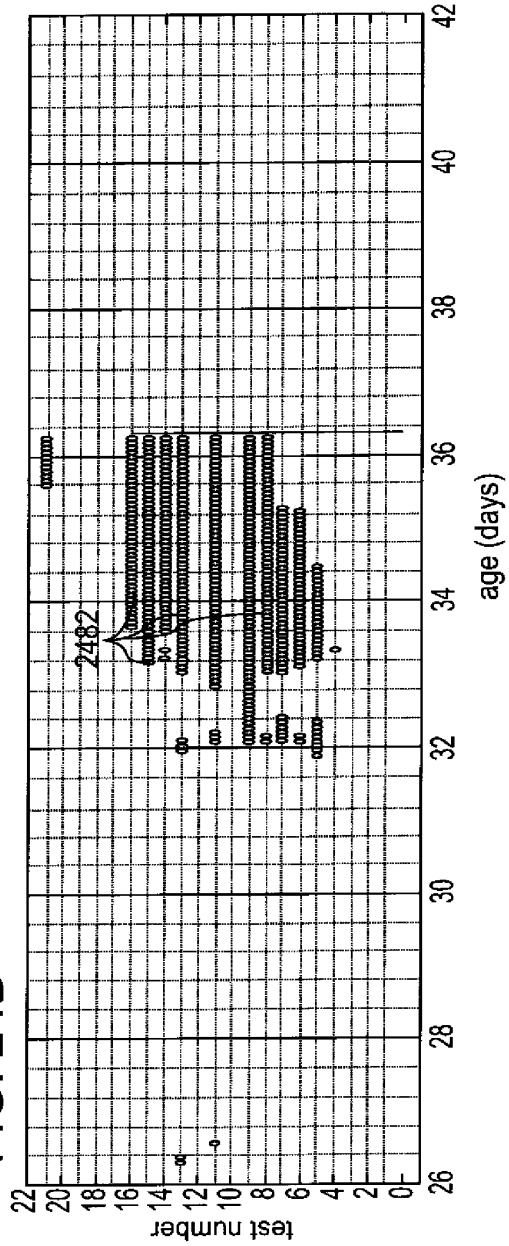


FIG. 24B



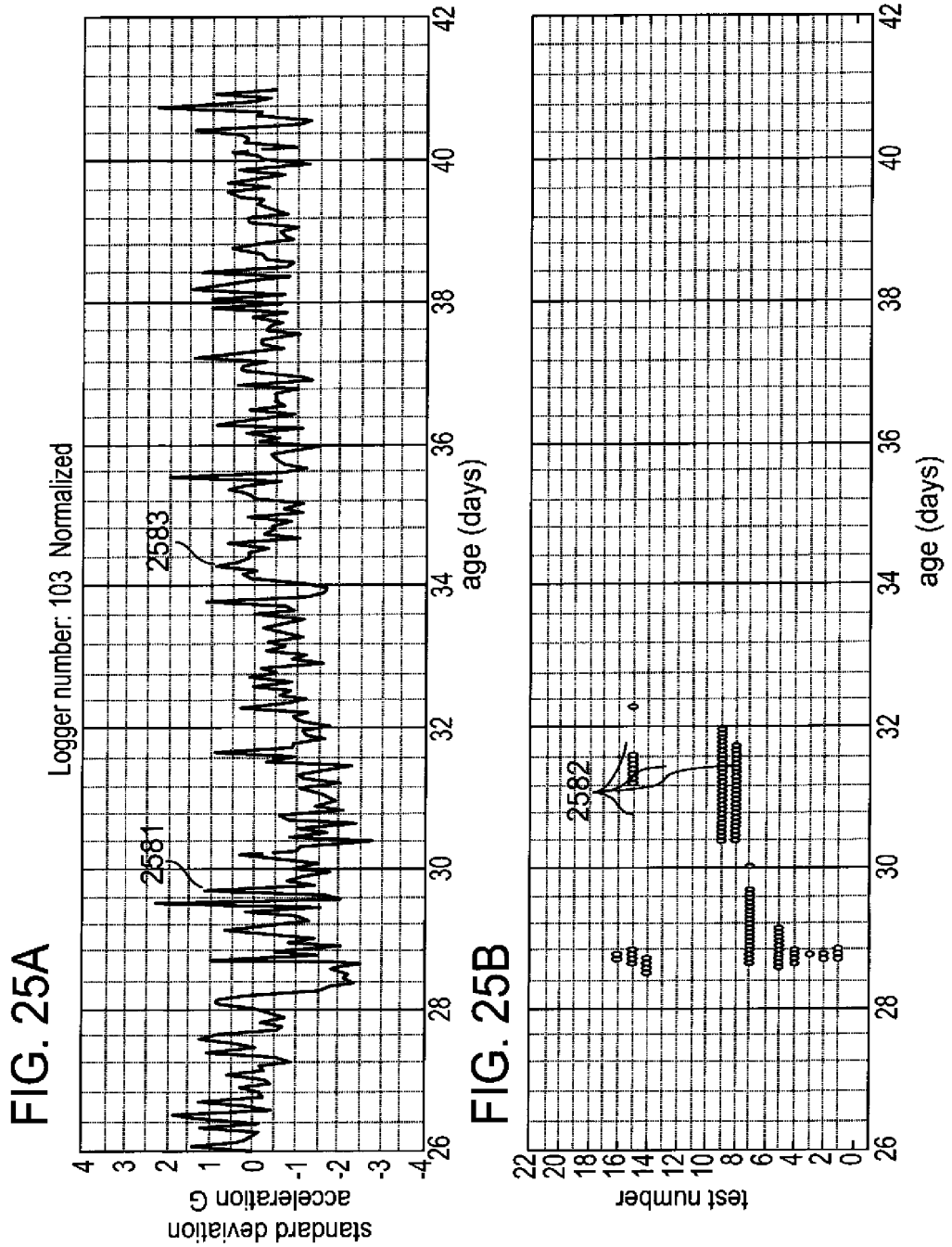
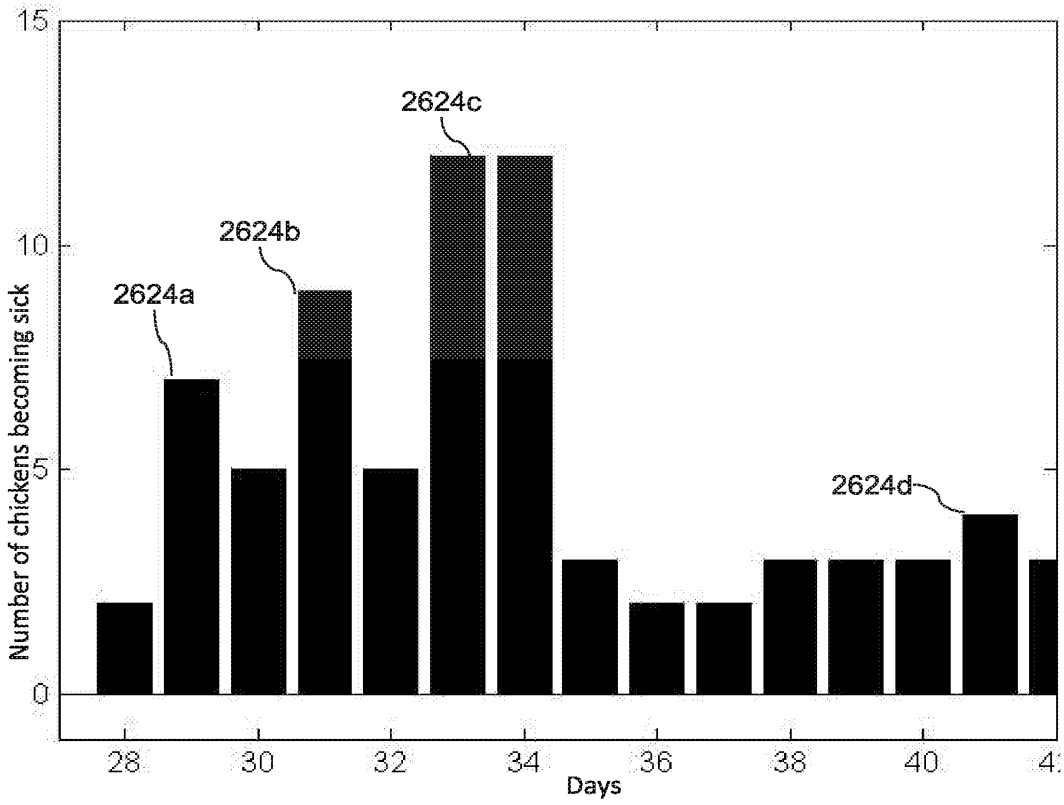


FIG. 25A

FIG. 25B

FIG. 26


15
10
5
0
Number of chickens becoming sick
2624a
2624b
2624c
2624d
28
30
32
34
36
38
40
Days

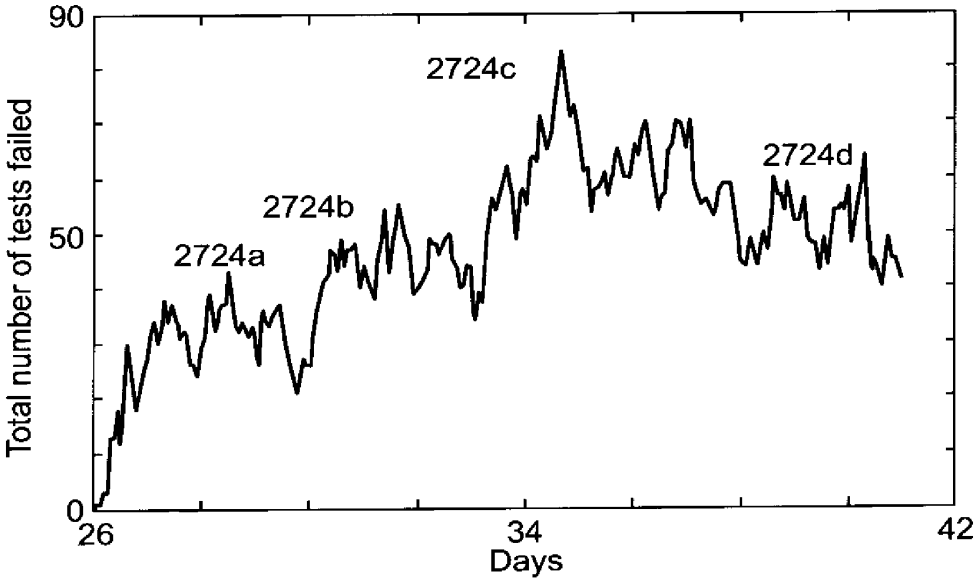


FIG. 27A

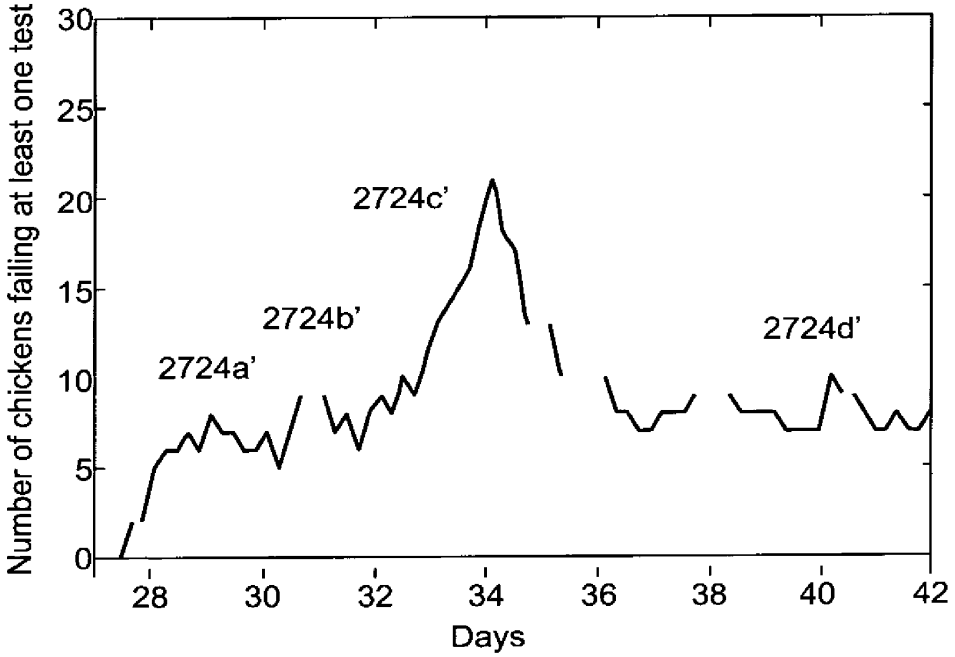


FIG. 27B

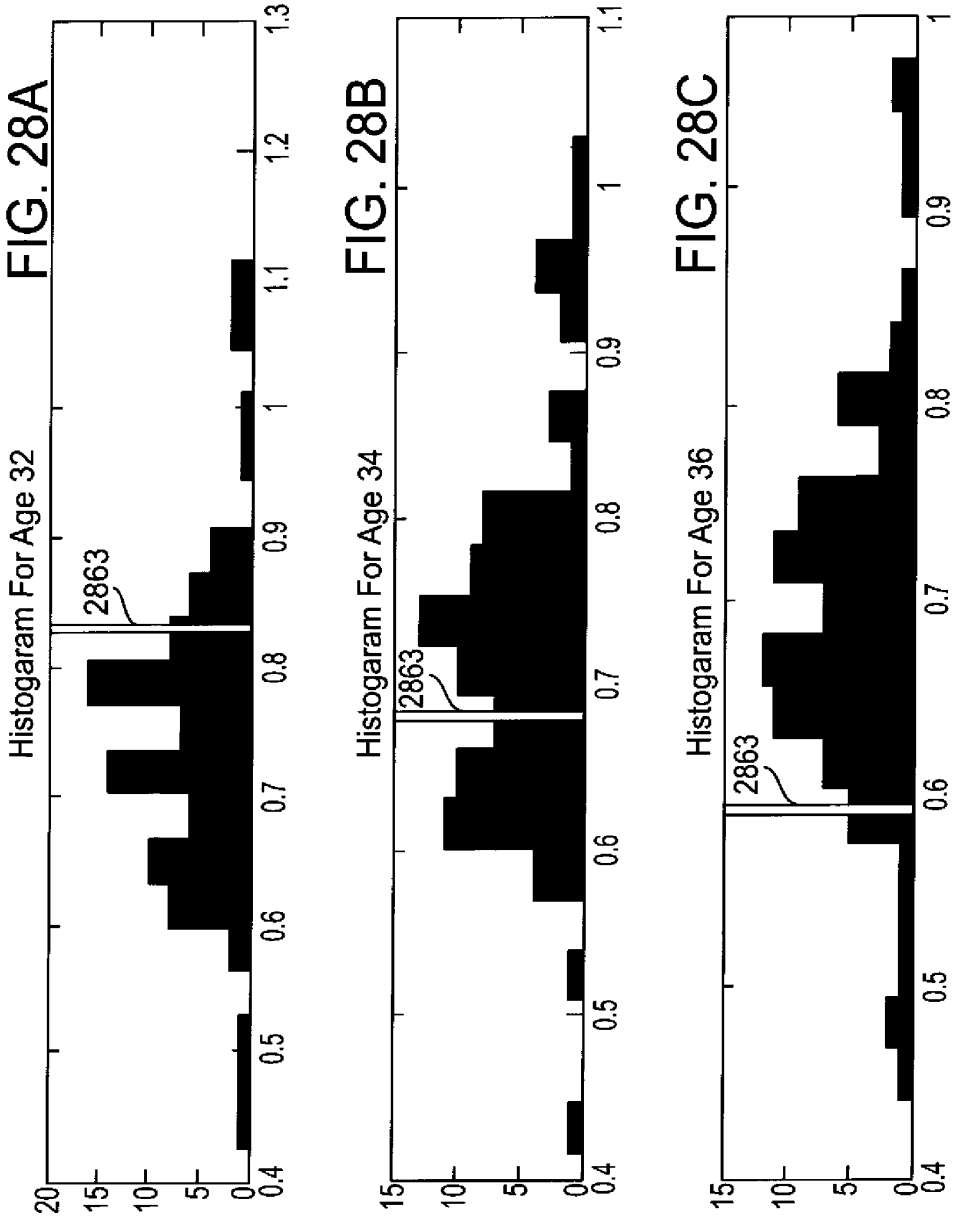
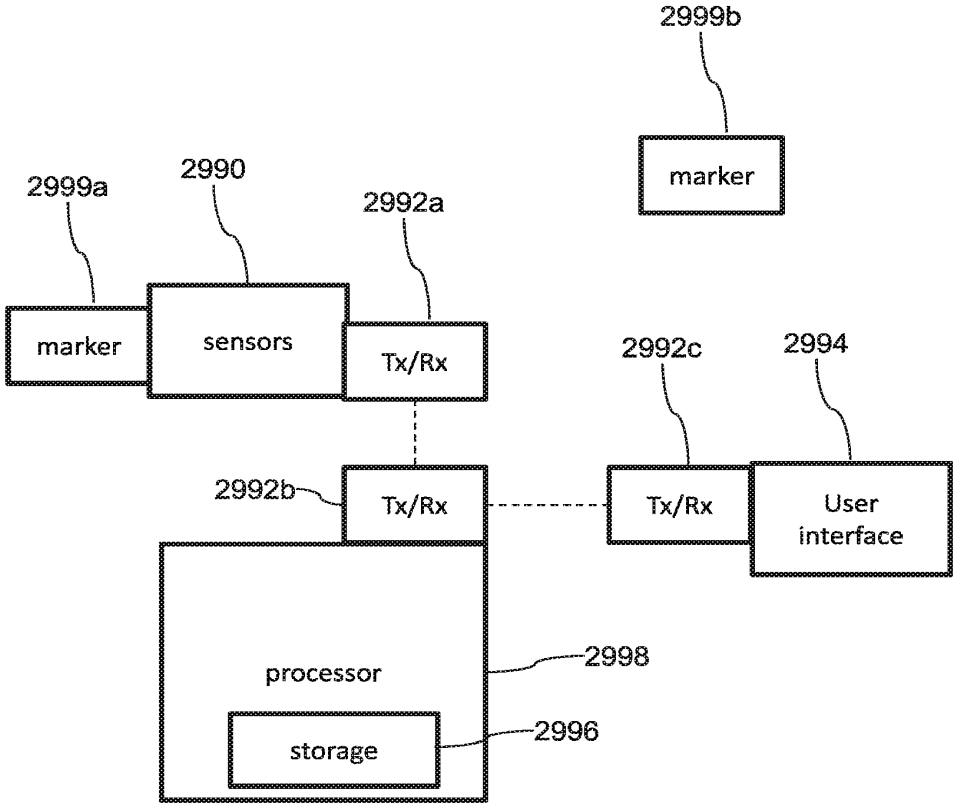

FIG. 28A
Histogaram For Age 32
2863
20
15
10
5
0
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
FIG. 28B
Histogaram For Age 34
2863
15
10
5
0
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
FIG. 28C
Histogaram For Age 36
2863
15
10
5
0
0.4
0.5
0.6
0.7
0.8
0.9
1

FIG. 29


2999b
marker
2999a
2990
2992a
marker
sensors
Tx/Rx
2992c
2994
2992b
Tx/Rx
Tx/Rx
User interface
processor
2998
storage
2996

Electronic Acknowledgement Receipt	
EFS ID:	34047925
Application Number:	15775706
International Application Number:	
Confirmation Number:	3566
Title of Invention:	System and Method of Determining the Health and Gender of a Chick
First Named Inventor/Applicant Name:	Ramin Karimpour
Customer Number:	90741
Filer:	Kathleen M. Lynch
Filer Authorized By:	
Attorney Docket Number:	374-2
Receipt Date:	18-OCT-2018
Filing Date:	11-MAY-2018
Time Stamp:	13:38:08
Application Type:	U.S. National Stage under 35 USC 371

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	Information Disclosure Statement (IDS) Form (SB08)	IDS1flat.pdf	229555 825c7368ef725a56f1ada4c45aa589191978cbaa	no	2

Warnings:

Information:					
This is not an USPTO supplied IDS fillable form					
2	Information Disclosure Statement (IDS) Form (SB08)	IDS2flat.pdf	216940 7a502e90695e107a59f273faa5bdbbf5ebf9d9d0	no	2
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Information Disclosure Statement (IDS) Form (SB08)	IDS3flat.pdf	200608 b9d4407d3210fa24db610f28c343bd74e755eb62	no	2
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
4	Foreign Reference	EP2579188A1.pdf	725179 8a1733fa227d2c6e98307d9a4e954dfffc329be7	no	11
Warnings:					
Information:					
5	Foreign Reference	WO2014118788.pdf	7494585 986ee6f78b7674ef979eb84a395f2c5999852223	no	151
Warnings:					
Information:					
6	Non Patent Literature	Guyetalarticle.pdf	6121618 17f3a71c64e074f07d6f6132fe24e99b9a0fc1ff	no	7
Warnings:					
Information:					
7	Non Patent Literature	Gershmanreference.pdf	5018897 d06bf65ff585e1fc94d23a6b0ebc5d02e2bd6e4a	no	11
Warnings:					
Information:					
			Total Files Size (in bytes):	20007382	

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New Applications Under 35 U.S.C. 111

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.

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

Application of:	Ramin Karimpour
Serial No.:	15/775,706
Title:	System and Method for Determining the Health and Gender of a Chick

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

RESPONSE TO NOTICE OF INSUFFICIENCY

UNDER 37 C.F.R. 1.492 AND/OR 1.495 (DO/EO/US)

Dear Sir:

Applicant is response to a Notice of Insufficiency mailed September 4, 2018 regarding the above-identified application. The notice indicates that an additional fee of $50.00 is due for one additional claim over 20. Applicant submits payment herewith concurrently with the filing of this response.

The Office is respectfully invited to contact the undersigned at (919) 696-8659 to discuss any matter relating to this application.

Respectfully submitted,

/Kathleen Lynch/

Kathleen M. Lynch

Date: October 17, 2018 Reg. No. 33957

Lynch Van Sickle, PLLC
201 Shannon Oaks Circle, Suite 200
Cary, NC 27518
(919) 469-5685
kml@lynchvansickle.com
www.lynchvansickle.com

Electronic Patent Application Fee Transmittal

Application Number:	15775706
Filing Date:	11-May-2018
Title of Invention:	System and Method of Determining the Health and Gender of a Chick
First Named Inventor/Applicant Name:	Ramin Karimpour
Filer:	Kathleen M. Lynch
Attorney Docket Number:	374-2

Filed as Small Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	2615	1	50	50
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**50**

Electronic Acknowledgement Receipt	
EFS ID:	34031687
Application Number:	15775706
International Application Number:	
Confirmation Number:	3566
Title of Invention:	System and Method of Determining the Health and Gender of a Chick
First Named Inventor/Applicant Name:	Ramin Karimpour
Customer Number:	90741
Filer:	Kathleen M. Lynch
Filer Authorized By:	
Attorney Docket Number:	374-2
Receipt Date:	17-OCT-2018
Filing Date:	11-MAY-2018
Time Stamp:	10:11:48
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$50
RAM confirmation Number	101718INTEFSW10140200
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	Transmittal Letter	ResptoNotofInsuff101718.pdf	125597 67a5a1dfc317f224aaaf3d6dc26c383be9786479	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30320 ff9ae6c1c6669198d35451a9661297cf4d465bb5	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	155917		

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New Applications Under 35 U.S.C. 111
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.
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.

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
15/775,706	05/11/2018		600	374-2	21	3

CONFIRMATION NO. 3566

FILING RECEIPT

90741
Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518

OC000000102009737

Date Mailed: 09/04/2018

Receipt is acknowledged of this non-provisional 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 APPLICANT, 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 Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections 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**

Inventor(s)

Ramin Karimpour, Raleigh, NC;

Applicant(s)

Applied LifeSciences and Systems, LLC, Raleigh, NEW CALEDONIA

Assignment For Published Patent Application

Applied LifeSciences and Systems, LLC, Raleigh, NC

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/US2016/061536 11/11/2017
which claims benefit of 62/349,981 06/14/2016
and claims benefit of 62/254,737 11/13/2015

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

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.

If Required, Foreign Filing License Granted: 08/30/2018

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/775,706**

Projected Publication Date: 12/13/2018

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

System and Method of Determining the Health and Gender of a Chick

Preliminary Class

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

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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 AssetsControl, 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

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MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET

Substitute for Form PTO-1360
(For use with Form PTO/SB/06)

Application Number	Filing Date
15775706	
Applicant(s) Ramin Karimpour	

* May be used for additional claims or amendments

CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT	
	Indep	Depend	Indep	Depend	Indep	Depend
1	1		1			
2		1		1		
3		1		1		
4		1	---	---		
5		1	---	---		
6		1	---	---		
7		1		1		
8		1		1		
9	1		1			
10		1		1		
11		1	---	---		
12	1		---	---		
13		1	---	---		
14		1	---	---		
15		1	---	---		
16		1	---	---		
17		1	---	---		
18		1	---	---		
19		1	---	---		
20		1	---	---		
21			1			
22				1		
23				1		
24				1		
25				1		
26				1		
27				1		
28				1		
29				1		
30				1		
31				1		
32				1		
33				1		
34				1		
35						
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37						
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44						
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Total Indep	3		3		0	
Total Depend	17	↵	18	↵	0	↵
Total Claims	20		21		0	

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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

U.S. APPLICATION NUMBER NO.	FIRST NAMED INVENTOR	ATTY. DOCKET NO.
15/775,706	Ramin Karimpour	374-2

90741
Lynch Van Sickle, PLLC
201 Shannon Oaks Circle
Suite 200
Cary, NC 27518

INTERNATIONAL APPLICATION NO.	
PCT/US2016/061536	
I.A. FILING DATE	PRIORITY DATE
11/11/2017	11/13/2015

CONFIRMATION NO. 3566
371 FORMALITIES LETTER

OC000000102009738

Date Mailed: 09/04/2018

Notification of Insufficiency Under 37 CFR 1.492 and/or 1.495 (DO/EO/US)

The following items have been submitted by the applicant or the International Bureau to the United States Patent and Trademark Office as a Designated / Elected Office (37 CFR 1.495).

- Indication of Small Entity Status
- Priority Document
- Copy of the International Application filed on 05/11/2018
- Copy of the International Search Report filed on 05/11/2018
- Preliminary Amendments filed on 05/11/2018
- Inventor's Oath or Declaration filed on 05/11/2018
- Request for Immediate Examination filed on 05/11/2018
- U.S. Basic National Fees filed on 05/11/2018
- Assignment filed on 05/11/2018
- Assignee Statement for PGPUB filed on 05/11/2018
- Authorize Access to Search Results filed on 05/11/2018
- Priority Documents filed on 05/11/2018
- Authorization to Permit Access filed on 05/11/2018
- Application Data Sheet (37 CFR 1.76) filed on 05/11/2018

The following items **MUST** be furnished within the period set forth below:

- Additional claim fees of $**50** as a small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.

SUMMARY OF FEES DUE:

Total additional fees required for this application is $**50** for a Small Entity:

Total additional claim fee(s) for this application is $**50**
- $**50** for **1** total claims over 20.

ALL OF THE ITEMS SET FORTH ABOVE MUST BE SUBMITTED WITHIN TWO (2) MONTHS FROM THE DATE OF THIS NOTICE. FAILURE TO PROPERLY RESPOND WILL RESULT IN ABANDONMENT.

The time period set above may be extended by filing a petition and fee for extension of time under the provisions of 37 CFR 1.136(a).

FORM PCT/DO/EO/923 (371 Formalities Notice)

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

ROSA M WEST

Telephone: (571) 272-1019

FORM PCT/DO/EO/923 (371 Formalities Notice)

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/775,706

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	150		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	260		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	380		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	21 minus 20 =	* 1	x 50 =	50	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*	x 230 =	0.00			
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).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	840		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	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.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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 displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/775,706	Filing Date 05/11/2018	☐ To be Mailed

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 $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ 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

AMENDMENT	05/11/2018	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 21	Minus	** 21	= 0	X $50 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $230 =	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		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ 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.
** 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 number found in the appropriate box in column 1.

LIE
CAROLYN THOMAS

This collection of information is required by 37 CFR 1.16. 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 12 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.

PCT REQUEST

Original (for **SUBMISSION**)

VIII-2-1	**Declaration: Entitlement to apply for and be granted a patent** Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51bis.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate: Name (LAST, First)	In relation to this international application KARIMPOUR, Ramin is entitled to apply for and be granted a patent by virtue of the following:
VIII-2-1(i)		KARIMPOUR, Ramin of 2804 Glen Burnie Drive Raleigh, NC 27607 United States of America is the inventor of the subject matter for which protection is sought by way of this international application

PCT REQUEST

Original (for **SUBMISSION**)

0	**For receiving Office use only**	
0-1	International Application No.	PCT/US16/61536
0-2	International Filing Date	11 NOV 2016 (11.11.16)
0-3	Name of receiving Office and "PCT International Application"	PCT INTERNATIONAL APPLICATION RO/US

0-4	**Form PCT/RO/101 PCT Request**	
0-4-1	Prepared Using	PCT-SAFE [EFS-Web mode] Version 3.51.075.251 MT/FOP 20161001/0.20.5.24
0-5	**Petition** The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	**Receiving Office (specified by the applicant)**	United States Patent and Trademark Office (USPTO) (RO/US)
0-7	**Applicant's or agent's file reference**	ALS-S-CHICK
I	**Title of Invention**	SYSTEM AND METHOD OF DETERMINING THE HEALTH & GENDER OF A CHICK
II	**Applicant**	
II-1	This person is	Applicant and inventor
II-2	Applicant for	All designated States
II-4	Name (LAST, First)	KARIMPOUR, Ramin
II-5	Address	2804 Glen Burnie Drive Raleigh, North Carolina 27607 United States of America
II-6	State of nationality	US
II-7	State of residence	US
II-8	Telephone No.	(919) 654-6735
II-10	e-mail	klynch@kliplaw.com
II-10(a)	E-mail authorization The receiving Office, the International Searching Authority, the International Bureau and the International Preliminary Examining Authority are authorized to use this e-mail address, if the Office or Authority so wishes, to send notifications issued in respect of this international application:	exclusively in electronic form (no paper notifications will be sent)

PCT REQUEST

Original (for **SUBMISSION**)

IV-1	**Agent or common representative; or address for correspondence**	
	The person identified below is hereby/ has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	Agent
IV-1-1	Name (LAST, First)	LYNCH, Kathleen M.
IV-1-2	Address	2500 Regency Parkway Cary, North Carolina 27518 United States of America
IV-1-3	Telephone No.	(919) 654-6735
IV-1-5	e-mail	klynch@kliplaw.com
IV-1-5(a)	E-mail authorization The receiving Office, the International Searching Authority, the International Bureau and the International Preliminary Examining Authority are authorized to use this e-mail address, if the Office or Authority so wishes, to send notifications issued in respect of this international application:	exclusively in electronic form (no paper notifications will be sent)
IV-1-6	Agent's registration No.	33957
V	**DESIGNATIONS**	
V-1	**The filing of this request constitutes under Rule 4.9(a), the designation of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.**	
VI-1	**Priority claim of earlier national application**	
VI-1-1	Filing date	13 November 2015 (13.11.2015)
VI-1-2	Number	62/254,737
VI-1-3	Country or Member of WTO	US
VI-2	**Priority claim of earlier national application**	
VI-2-1	Filing date	14 June 2016 (14.06.2016)
VI-2-2	Number	62/349,981
VI-2-3	Country or Member of WTO	US
VI-3	**Priority document request**	
	The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1 VI-2

PCT REQUEST

Original (for **SUBMISSION**)

VI-4	**Incorporation by reference :** where an element of the international application referred to in Article 11(1)(iii)(d) or (e) or a part of the description, claims or drawings referred to in Rule 20.5(a) is not otherwise contained in this international application but is completely contained in an earlier application whose priority is claimed on the date on which one or more elements referred to in Article 11(1)(iii) were first received by the receiving Office, that element or part is, subject to confirmation under Rule 20.6, incorporated by reference in this international application for the purposes of Rule 20.6.		
VII-1	**International Searching Authority Chosen**	**United States Patent and Trademark Office (USPTO) (ISA/US)**	
VIII	**Declarations**	Number of declarations	
VIII-1	Declaration as to the identity of the inventor	–	
VIII-2	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent	1	
VIII-3	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application	2	
VIII-4	Declaration of inventorship (only for the purposes of the designation of the United States of America)	–	
VIII-5	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty	–	

PCT REQUEST

Original (for **SUBMISSION**)

IX	Check list	Number of sheets	Electronic file(s) attached
IX-1	Request (including declaration sheets)	7	✓
IX-2	Description	9	–
IX-3	Claims	4	–
IX-4	Abstract	1	✓
IX-5	Drawings	7 ~~8~~	–
IX-7	TOTAL	28 ~~29~~	
	Accompanying Items	Paper document(s) attached	Electronic file(s) attached
IX-8	Fee calculation sheet	✓	–
IX-20	**Figure of the drawings which should accompany the abstract**		
IX-21	**Language of filing of the international application**	English	
X-1	**Signature of applicant, agent or common representative**	/Kathleen M. Lynch/ Reg. No. 33,957	
X-1-1	Name (LAST, First)	LYNCH, Kathleen M.	
X-1-3	Capacity (if such capacity is not obvious from reading the request)		

FOR RECEIVING OFFICE USE ONLY

10-1	**Date of actual receipt of the purported international application**	11-11-2016
10-2	**Drawings:**	
10-2-1	Received	
10-2-2	Not received	
10-3	**Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application**	
10-4	**Date of timely receipt of the required corrections under PCT Article 11(2)**	
10-5	**International Searching Authority**	ISA/US
10-6	**Transmittal of search copy delayed until search fee is paid**	

FOR INTERNATIONAL BUREAU USE ONLY

11-1	**Date of receipt of the record copy by the International Bureau**	

818386

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

November 23, 2016

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE.

APPLICATION NUMBER: *62/349,981*
FILING DATE: *June 14, 2016*
RELATED PCT APPLICATION NUMBER: *PCT/US16/61536*

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS *US62/349,981*

Certified by

Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	ALS-S Healthy Chick
	Application Number	
Title of Invention	SYSTEM AND METHOD OF DETERMINING THE HEALTH OF A DAY OLD CHICK	

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

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ramin		Karimpour	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Raleigh	State/Province	NC	Country of Residence i	US

Mailing Address of Inventor:

Address 1	3012 Cypress Knee Court
Address 2	

City	Raleigh	State/Province	NC
Postal Code	27607	Country i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

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	90741		
Email Address	klynch@kliplaw.com	Add Email	Remove Email

Application Information:

Title of the Invention	SYSTEM AND METHOD OF DETERMINING THE HEALTH OF A DAY OLD CHICK		
Attorney Docket Number	ALS-S Healthy Chick	Small Entity Status Claimed	☒
Application Type	Provisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	3	Suggested Figure for Publication (if any)	1

PTO/AIA/14 (08-15)
Approved for use through 04/30/2017. OMB 0651-0032
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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	ALS-S Healthy Chick
	Application Number	
Title of Invention	SYSTEM AND METHOD OF DETERMINING THE HEALTH OF A DAY OLD CHICK	

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	90741		

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	Remove
Registration Number					
Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	Remove
Registration Number					

Additional Representative Information blocks may be generated within this form by selecting the **Add** button.

PTO/AIA/14 (08-15)
Approved for use through 04/30/2017. OMB 0651-0032
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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	ALS-S Healthy Chick
	Application Number	
Title of Invention	SYSTEM AND METHOD OF DETERMINING THE HEALTH OF A DAY OLD CHICK	

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 this 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 blank.

Prior Application Status		Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

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) 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)

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.

PTO/AIA/14 (08-15)
Approved for use through 04/30/2017. OMB 0651-0032
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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	ALS-S Healthy Chick
	Application Number	
Title of Invention	SYSTEM AND METHOD OF DETERMINING THE HEALTH OF A DAY OLD CHICK	

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)

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	ALS-S Healthy Chick
	Application Number	
Title of Invention	SYSTEM AND METHOD OF DETERMINING THE HEALTH OF A DAY OLD CHICK	

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

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.	☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix
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Additional Applicant Data may be generated within this form by selecting the Add button.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	ALS-S Healthy Chick
	Application Number	
Title of Invention	SYSTEM AND METHOD OF DETERMINING THE HEALTH OF A DAY OLD CHICK	

Assignee Information including Non-Applicant Assignee Information:

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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.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	ALS-S Healthy Chick
	Application Number	
Title of Invention	SYSTEM AND METHOD OF DETERMINING THE HEALTH OF A DAY OLD CHICK	

Signature:

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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	/Kathleen Lynch/			Date (YYYY-MM-DD)	
First Name	Kathleen	Last Name	Lynch	Registration Number	33957

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SYSTEM AND METHOD OF DETERMINING THE HEALTH OF A DAY OLD CHICK

Field

The embodiments herein described are directed to a system and method for determining the health of a day old chick. The system and method can determine abnormalities in day old chicks so that they can be removed from the otherwise healthy flock. The separation of unhealthy chicks prevents the spread of any infection or disease and prevents further injury to the unhealthy chick.

Background

There are essentially three types of poultry that are processed in today's mass production environment: broilers, breeders and layers. The broilers are grown and slaughtered at maturity for human consumption. Breeders are raised to breed broilers, and layers are raised to lay eggs for human and animal consumption. In each case, as chicks hatch, they are quickly processed and moved to the next stage of their life. Day old chicks are vulnerable to disease and infection. Due to the crowded conditions in which chicks hatch and live, any chick born with an abnormality or disease may be in a position to infect a multitude of other chicks in the surrounding area. Thus it is critical to the health of the flock to remove any chick having a disease or malformation that could cause illness to other chicks. Moreover, it is only humane to remove any seriously ill chicks or disabled chicks so that they can be humanely euthanized and disposed of before causing further injury to themselves.

Day old chicks are processed quickly in hatcheries and are swiftly transported to "Growth Farms" where they will live and grow to desire weight for consumption.
There are two common maladies that afflict some chicks. The first is a failure of the abdominal wall to close. In such a case, the chick hatches with an open abdominal cavity. This condition is typically terminal. If left undetected for any length of time, the open wound will attract unwanted bacteria and infection to the area and could cause disease among the chicks.

The second affliction is a malformed or disabled leg or foot. Chicks with malformed legs and feet are unable to withstand the rigors of a mass farming environment, get adequate feed and

water in "Growth Farm" and consequently grow as well as their healthy counterparts. Thus, they need to be removed as quickly as possible.

Thus, there is a need to quickly and efficiently inspect day old chicks to determine whether or not they are sufficiently healthy to withstand the rigors of the poultry production environment. In addition, there is a need to quickly and efficiently detect any physical abnormalities in day old chicks so that those with such abnormalities may be separated from the otherwise healthy flock.

Summary

The embodiments described herein include a system having a device for positioning a chick on a moving platform, and an image capturing device to capture at least one electronic image of the chick on the moving platform. The system further includes a database containing electronic images of healthy and unhealthy chicks within the chick's species, and an image processor in communication with the image capture device and the database. When the captured image of the chick is sent to the image processor, it is compared to the database of chick images and if the image of the chick deviates from the images of healthy chicks in the database or matched with images of unhealthy chicks or presents any anomalies, the chick is separated out from the flock.

The positioning device may be a conveyor belt. The image capture device may be a digital camera. Preferably, the moving platform may move at a speed of 1 foot per second or more. The image taken of the chick may be a frontal image. The image taken of the chick may be of its torso. The image taken of the chick may be of its legs and feet.

The embodiments herein described further include a method for determining the health of a day old chick including the steps of positioning a chick on a moving platform and capturing at least one electronic image of the chick on the moving platform. The method also includes providing a database containing electronic images of healthy chicks within the chick's species and providing an image processor in communication with the image capture device and the database. The method further includes comparing the captured image with the electronic images in the database and determining if the captured image deviates from those in the database.

The method previously described may also include separating out any chick having a captured image that deviates from the images in the database.

The method previously described regarding the positioning of the chick may be accomplished with a conveyor belt.

The method previously described wherein the capturing of an image is accomplished with a digital camera.

The method previously described wherein the chicks are moving at a speed of at least 1 foot/second.

The method previously described wherein the image captured is a frontal image.

The method previously described wherein the image is that of the feet and legs.

The method previously described wherein the image is that of the torso.

The method previously described wherein the separation is accomplished by altering the position of the moving platform so as to cause the unhealthy chick to fall a short distance off of the moving platform.

The method previously described wherein the moving platform position is altered by means of an actuator fixed to the frame of the moving platform.

The method previously described wherein the actuator is controlled remotely.

Description of the Drawings

Other objects, features and advantages of the embodiments will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

Fig. 1 is a perspective view of the first embodiment;

Fig. 2 is a side view of the embodiment of Fig. 1;
Fig. 3. is an enlarged view of the angled conveyor belt of the embodiment of Fig. 1; and
Fig. 4 is a diagrammatic representation of the communication of various elements of the embodiment of Fig. 1.
The embodiments herein described are not intended to be limiting. It is intended that the embodiments shall cover all alternatives, modifications, and equivalents as defined herein.

Description

The embodiments herein focus on a system and method for inspecting the health of newly hatched chicks and separating any unhealthy chicks from the flock. The first embodiment 10, shown in Fig. 1 includes a first conveyor belt 12 that moves the chicks 14 from the hatchery. It should be appreciated that the chicks have been previously separated by other conveyor belts and dividers and are now travelling along the first conveyor belt 12 in single file fashion.

An angled conveyor belt 16 is positioned adjacent to and below the first conveyor belt 12. The angled conveyor belt 16 is oriented at an angle θ to the horizon. Preferably, the angle θ of the angled conveyor belt is about 30° from the horizon.

The angled conveyor belt 16 has a near end 18 and a far end 20. A continuous belt 16 rotates about the near 18 and far 20 ends to cause the belt to move and thus cause anything on the surface of the belt such as a chick 14 to also move. The angled conveyor belt 16 has a frame 21 to support the angled conveyor belt and continuous belt 16. The angled conveyor belt 16 is rotatably connected at the near end 18.

An actuator 24 is fixedly connected to the frame 21 of the angled conveyor belt 16 and also to a support structure such as a wall. The actuator 24 is positioned normally to support the angled conveyor belt 16 in its operational position. When activated, the actuator retracts causing the angled conveyor belt 16 to pivot about its near end 18 and swing the far end 20 further downward increasing the angle θ.

A third conveyor belt 40 is located below angled conveyor belt 16 and is positioned to receive chicks 14 therefrom. The first 12, angled 16 and third 40 conveyor belts would preferably run at a speed of 1 foot per second or more.

A motion sensor 27 is located along the pathway of the first conveyor belt 12. The motion sensor 27 senses the presence of a chick travelling along the pathway of the first conveyor belt 12.
Cameras 28 are positioned at the end of the first conveyor belt 20 and at one or more points along the angled conveyor belt 16. The cameras 28 are positioned to focus on the torso, legs and feet of the chicks 14 as they pass.

The first embodiment 10 further includes a computerized image processor 30 in communication with an electronic database 32 having a library of digital images of healthy and unhealthy chicks of a variety of chicken species stored therein. A computerized image processor 30 is also in communication with the motion sensor 27, camera28, and actuator 24. Moreover, the computerized image processor 30 is also in communication with a master control system 34 which controls the speed of the first 12 and angled 16 conveyor belts and controls the overall speed of operation. A diagrammatic representation of the communication between the aforementioned elements is shown in Fig. 4.

In use, after the chicks 14 hatch, they are initially processed and eventually moved onto the first conveyor belt 12. As the chick 14 travels along the first conveyor belt 12, motion sensor 27 detects the presence of a chick travelling along the first conveyor belt 12. The motion sensor 27 communicates with the computerized image processor 30 which activates the cameras 28 positioned at the end of the pathway of the first conveyor belt 12 and along the angled conveyor belt 16. The camera 28 takes at least one image of the chick. Preferably the camera 28 is able to take multiple images of the chick's abdomen, legs and feet.

The image or images are electronically communicated to the computerized image processor 30. The computerized image processor 30 compares the image sent by the camera 28 with those images in database 32 of healthy and unhealthy chicks of the same species. In comparing the

camera image with the digital image library in the database 32, the computerized image processor 30 is able to detect any abnormalities or deviations in the image taken from standard images in the database. If there is a deviation, the computerized image processor 30 activates the actuator 24. This causes the near end 18 of the angled conveyor belt 16 to pivot and the far end 20 to swing downwardly increasing the angle θ. At a certain angle θ, the chick 14 cannot remain thereon and is dropped onto an alternate platform (not shown) for further manual inspection. If the chick is unhealthy, it will be separated from the otherwise healthy flock. If the chick is, in fact, healthy, it will be returned to the flock for further processing.

Once the chick has been transferred to an alternate platform, the actuator is deactivated and returns to its extended position. This results in the far end 20 of the angled conveyor belt 16 swinging upwardly as the near end 18 pivots about itself and the angle θ declines. Once the actuator has returned the angled conveyor belt 16 to its original position, it is ready to receive another chick.

Thus it is apparent that the embodiments herein provided fully satisfy the objects, aims and advantages set forth above. It is evident that many alternatives, modifications and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly it is intended to embrace all such alternatives, modifications, and variations as fall within the spirit and scope of the appended claims.

Claims

What is claimed is:

1. A system for determining the health of a day old chick comprising:

a moving platform upon which a chick is positioned;

image capturing device to capture at least one electronic image of the chick on the moving platform;

a database containing electronic images of healthy and unhealthy chicks within the chick's species;

computerized image processor in communication with the image capture device and the database,

whereby the captured image of the chick is sent to the computerize image processor where it is compared to the database and if the image of the chick deviates from the images in the database, the moving chick is separated out from the flock.

2. The system of claim 1 wherein the image capture device is a digital camera.

3. The system of claim 1 wherein the chicks are moving at a speed of at least 1feet per second.

4. The system of claim 1 wherein the image is that of the feet and legs.

5. The system of claim 1 wherein the image captured is that of the abdomen.

6. The system of claim 1 further comprising a device for altering the platform's position.

7. The system of claim 1 wherein the moving platform includes first and second ends through which a continuous belt travels, and a frame, the first end rotatably connected to a support structure and the device for altering the platform's position is attached to the frame.

8. The system of claim 7 wherein the device for altering the platform's position is an actuator.

9. A method for determining the health of a day old chick comprising:

positioning a chick on a moving platform;

providing an image capturing device to capture at least one electronic image of the chick on the moving platform;

providing a database containing electronic images of healthy chicks within the chick's species;

providing a computerized image processor in communication with the image capture device and the database; and

comparing the captured image with the electronic images in the database and determining if the captured image deviates from those in the database.

10. The method of claim 9 further comprising the step of separating out any chick having a captured image that deviates from the images in the database.

11. The method of claim 10 wherein the step of separating out the chicks comprises altering the position of the moving platform.

12. The method of claim 11 wherein the step of altering the position of the the moving platform is accomplished with an actuator attached to the frame of the moving platform.

13. The method of claim 9 wherein the image capturing device is a digital camera.

14. The method of claim 9 wherein the chicks are moving at a speed of at least 1 foot per second.

15. The method of claim 9 wherein the image is that of the feet and legs.

16. The method of claim 9 wherein the image captured is that of the abdomen.

18. A healthy chick inspection assembly comprising:
a moving platform for moving chicks thereon;
an image capture device positioned along the pathway of the moving platform;
device for altering the position of the moving platform; and
computerized image processor having a database of digital images of healthy and unhealthy chicks, the computerized image processor in communication with the image capture device and the position altering device, whereby when a chick passes along the moving platform, the image capture device captures at least one image and the image is compared to those in the database to determine if there is a deviation, and if the chick's image deviates from those in the database, the position of the moving platform is altered to cause the chick to move off.

19. The assembly of claim 18 wherein the moving platform includes first and second ends and a frame, the first end rotatably connected to a support structure.

20. The assembly of claim 19 wherein the moving platform position alteration device is an actuator fixed to the frame of the moving platform.

21. The assembly of claim 18 wherein the moving platform moves at a rate of 1 foot per second.

Abstract

A system and method for determining the health of a day old chick. The system includes a device for positioning a chick on a moving platform and an image capturing device to capture at least one electronic image of the chick on the moving platform. The system further includes a database containing electronic images of healthy and unhealthy chicks within the chick's species and an image processor in communication with the image capture device, the database and the system's master controller. When the captured image of the chick is shared with the image processor it is compared to the database of healthy and unhealthy chick images. Any deviations are signaled and the moving chick is automatically separated from the flock.

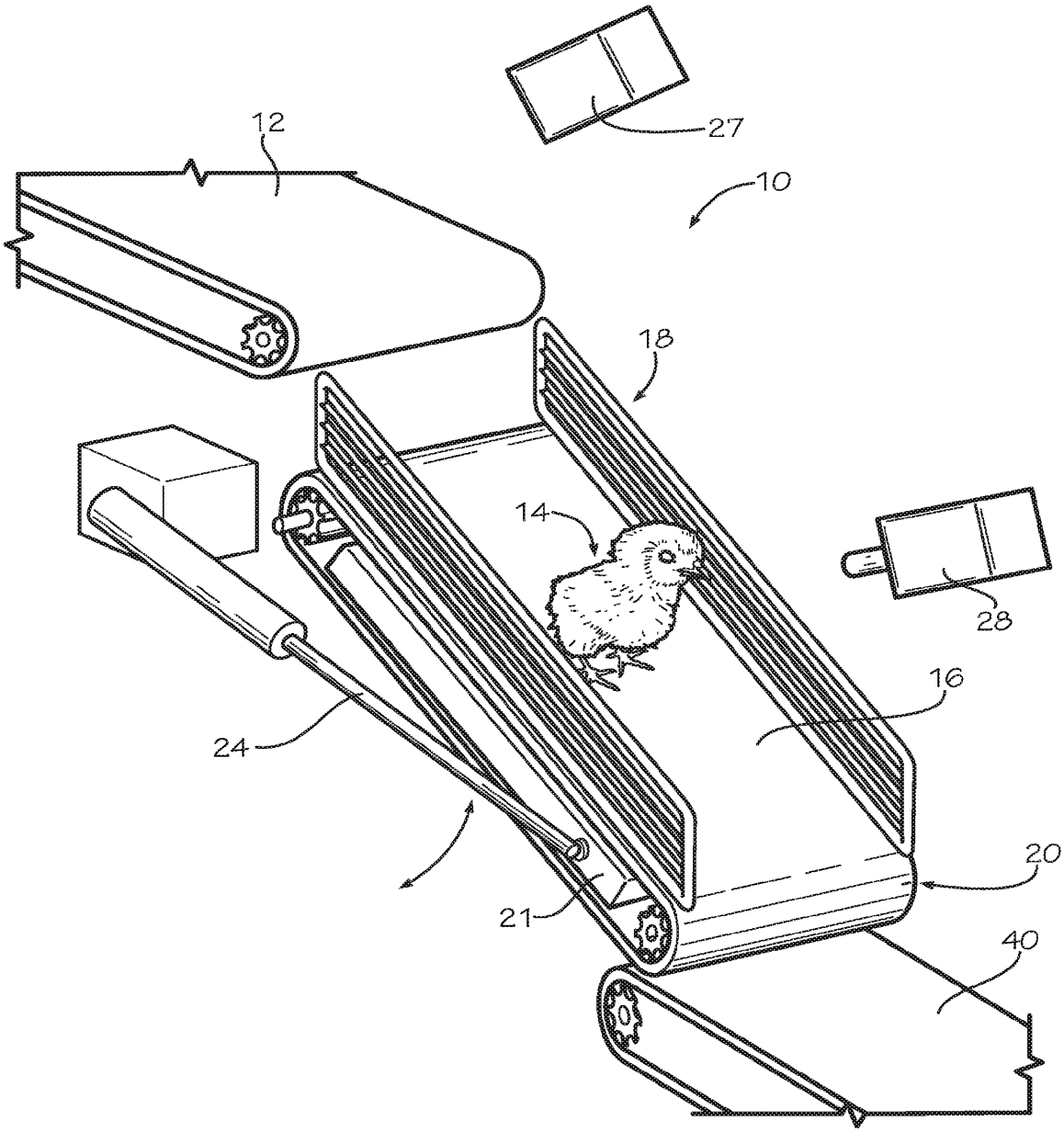


FIG. 1

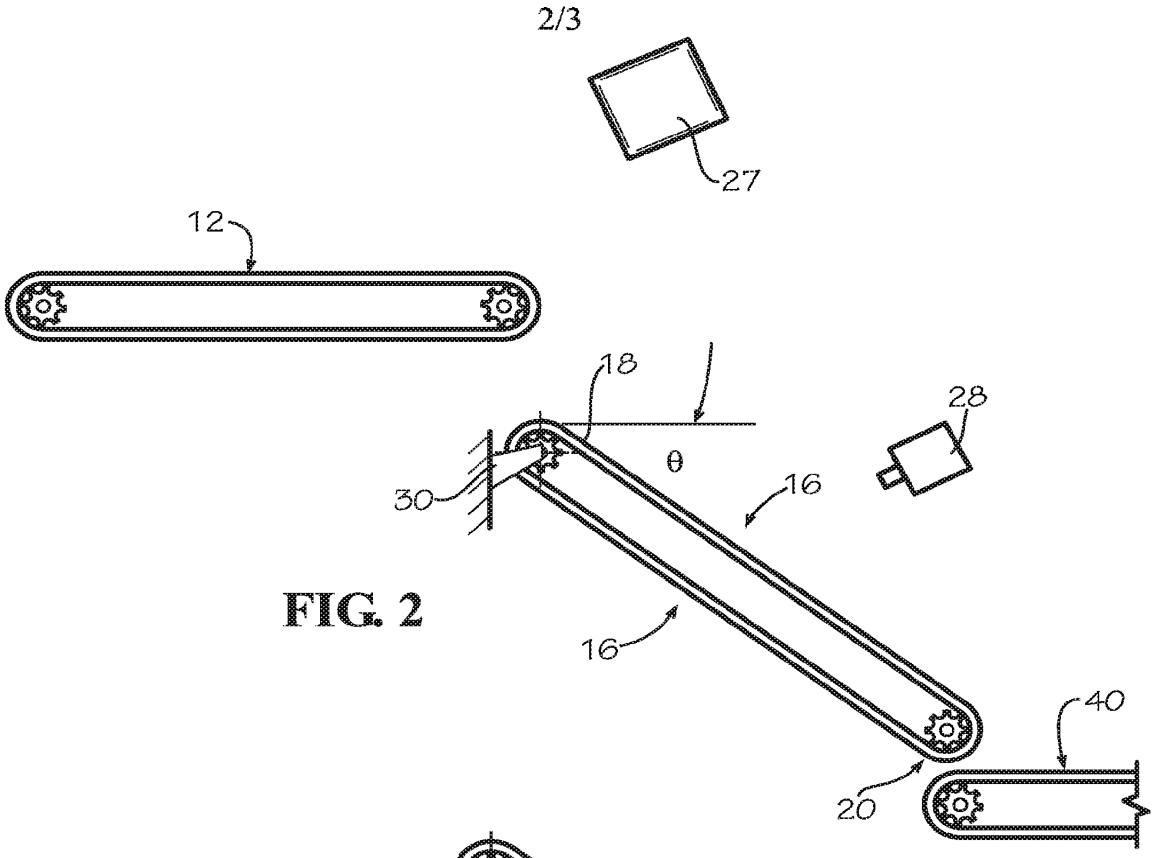


FIG. 2

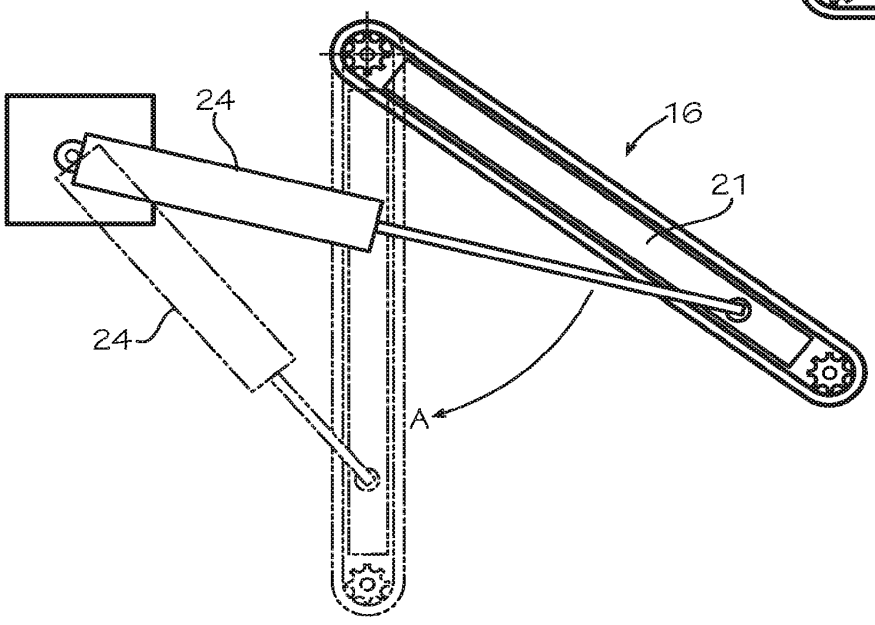


FIG. 3

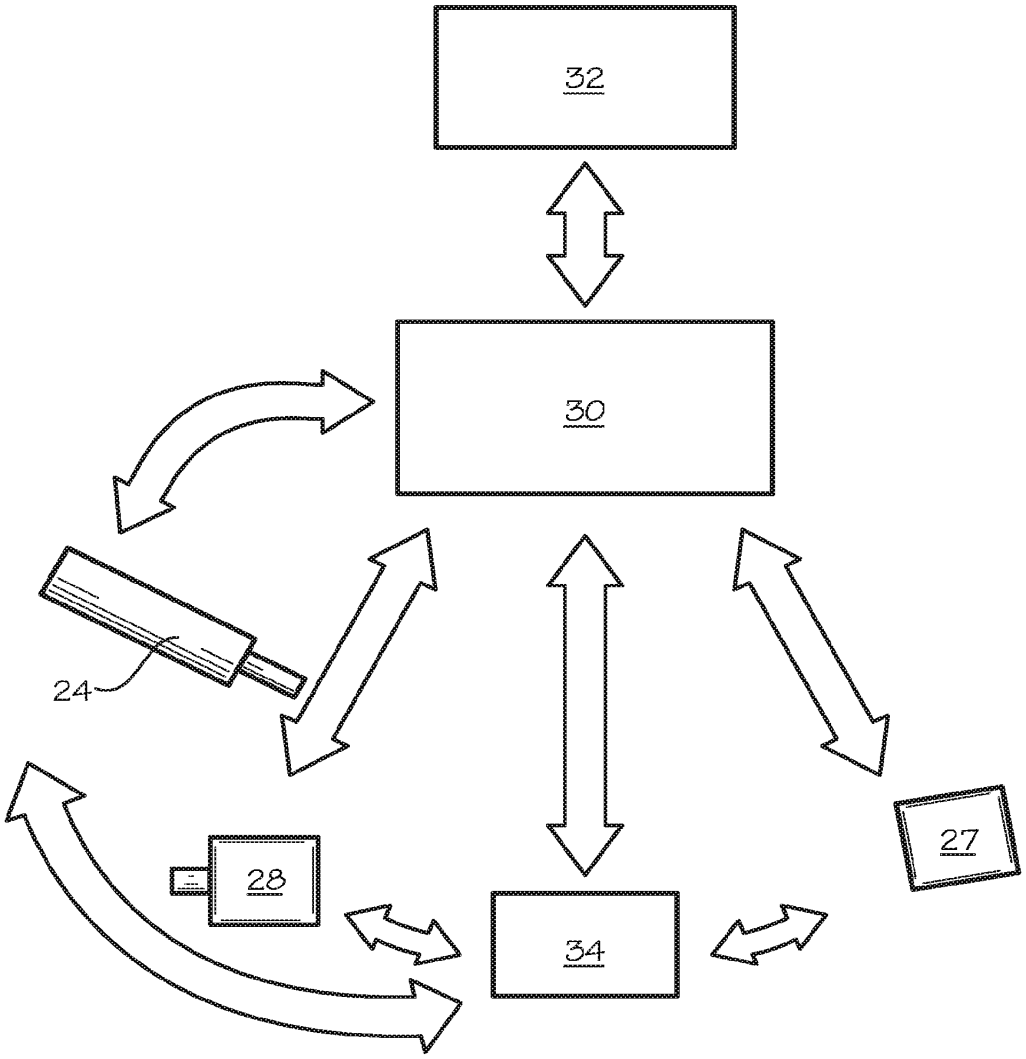


FIG. 4

Electronic Acknowledgement Receipt	
EFS ID:	26063363
Application Number:	62349981
International Application Number:	
Confirmation Number:	5162
Title of Invention:	SYSTEM AND METHOD OF DETERMINING THE HEALTH OF A DAY OLD CHICK
First Named Inventor/Applicant Name:	Ramin Karimpour
Customer Number:	90741
Filer:	Kathleen M. Lynch
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Attorney Docket Number:	ALS-S Healthy Chick
Receipt Date:	14-JUN-2016
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1	Application Data Sheet	WebADS.pdf	116514 fa6d8d877163bd73fe8cfc20555a9f7227fd02f1	no	7
Warnings:					
Information:					
2		finalspec.pdf	80827 6368a3765a338c305dbdb0dd2a4c8ee7e1187559	yes	10

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Document Description	Start	End
Specification	1	6
Claims	7	9
Abstract	10	10

Warnings:					
Information:					
3	Drawings-only black and white line drawings	finalfigs.pdf	75913 1b05f1b50ba9261245e74a17a7da4c666b619418	no	3
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	29675 4d485eab71b7569ab99c4a99d1f7d58497dfb7a1	no	2
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International filing date:		**11 November 2016 (11.11.2016)**
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Document details:	Country/Office:	**US**
	Number:	**62/349,981**
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Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a),(b) or (b-*bis*)

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PCT Recordation of Search History

Case/PCT Application Number: PCT/US16/61536

CLIN Number/Technical Field of PCT Application: CLIN 2

Date(s) During Which the Search was Conducted: 02 - 09 January 2017

Date of Completion of Recordation of Search History Form: 09 January 2017

Research Analyst Initials: J1Y

Search Approval Official (SAO) Initials: CEH

Field of Search/Classification Information:

IPC(8) Classifications: A01K45/00, A01K29/00, A61B5/00, B07C5/34, G06F19/00 (2017.01)

CPC Classifications: A01K45/00, A01K29/005, A61B5/0077, A61B2503/40, B07C5/34, G06F19/3443

Databases Searched (Patent and Non-Patent Literature (NPL), Including Sub-Databases and Files Searched) and Search Terms Used:

PatSeer (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, INPADOC Data); Google Scholar, Pubmed, EBSCO

Chick, hatchling, fledgling, sexing, female, male, determine, sense, detect, ascertain, wing, limb, open, wide, unfurl, spread, image, camera, photograph, database, library, bird, avian, computer, compare, day, old, health, disease, condition, illness, balance, destabilize, air, puff, stream, blast, strobe, flash, light, malformed, deformed, disabled, wound, screen, feather, monitor, breed, flapping, digital

Database Search String Recordation, Including Dates of Searches:

Patent Database Search Strategy/Results:

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ID	Search String	Records	Created Date
L36	IC:(A01K45/00 OR A01K29/00 OR A61B5/00 OR B07C5/34 OR G06F19/00)	453565	9-Jan-17
L35	CPC: (A01K45/00 OR A01K29/005 OR A61B5/0077 OR A61B2503/40 OR B07C5/34 OR G06F19/3443)	17358	9-Jan-17
L34	TACD:((chick* OR hatch* OR fledg*) AND (sex* OR female* OR male*) AND (determin* OR sens* OR detect* OR ascertain*) AND (wing* OR limb*) AND (open* OR wide* OR unfurl*) AND (imag* OR camera* OR photo*) AND (databas* OR librar*))	30274	9-Jan-17
L33	TACD:((chick*) AND ((health* OR condition* OR diseas* OR illness*) ws (determin* OR sens* OR detect* OR ascertain*)) AND ((camera* OR imag* OR photo*) wp (databas* OR librar*))) AND CPC:(A01K*)	993	8-Jan-17
L32	TACD:((day ws old ws chick*) AND ((health* OR condition* OR diseas* OR illness*) ws (determin* OR sens* OR detect* OR ascertain*)) AND ((camera* OR imag* OR photo*) wp (databas* OR librar*)))	809	8-Jan-17
L31	TACD:((day ws old ws chick*) AND ((health* OR condition* OR diseas* OR illness*) ws (determin* OR sens* OR detect* OR ascertain*)) AND ((camera* OR imag* OR photo*) wp (databas* OR librar*))) AND (CPC:(A01K* OR A61B5*) OR IC:(A01K* OR A61B5*))	81	8-Jan-17
L30	TACD:((chick*) AND ((health* OR condition* OR diseas* OR illness*) ws (determin* OR sens* OR detect* OR ascertain*)) AND ((camera* OR imag* OR photo*) wp (databas* OR librar*))) AND (CPC:(A01K* OR A61B5*) OR IC:(A01K* OR A61B5*))	1627	8-Jan-17
L29	TACD:((chick* OR hatch* OR fledg*) AND (health* OR condition* OR diseas* OR illness*) AND (determin* OR sens* OR detect* OR ascertain*) AND (camera* OR imag* OR photo*) AND (databas* OR librar*)) AND (CPC:(A01K* OR A61B5*) OR IC:(A01K* OR A61B5*))	15620	8-Jan-17
L28	TACD:((chick* OR hatch* OR fledg*) AND (health* OR condition* OR diseas* OR illness*) AND (determin* OR sens* OR detect* OR ascertain*) AND (camera* OR imag* OR photo*) AND (databas* OR librar*)) AND (CPC:(A01K* OR A61B*) OR IC:(A01K* OR A61B*))	17069	8-Jan-17

L27	TACD:((chick* OR hatch* OR fledg*) AND (*balanc* OR destabili*) AND (air* ws (puff* OR stream* OR blast*))) AND (CPC:(A01K*) OR IC:(A01K*))	516	8-Jan-17
L26	TACD:((chick* OR hatch* OR fledg*) AND ((open* OR wide* OR unfurl* OR spread*) ws (wing* OR limb*)) AND (air* ws (puff*))) AND (CPC:(A01K*) OR IC:(A01K*))	1	8-Jan-17
L25	TACD:((chick* OR hatch* OR fledg*) AND ((open* OR wide* OR unfurl* OR spread*) ws (wing* OR limb*)) AND (air* ws (stream* OR puff*))) AND (CPC:(A01K*) OR IC:(A01K*))	32	8-Jan-17
L24	TACD:((chick* OR hatch* OR fledg*) AND ((open* OR wide* OR unfurl* OR spread*) ws (wing* OR limb*)) AND (air* ws stream*)) AND (CPC:(A01K*) OR IC:(A01K*))	31	8-Jan-17
L23	TACD:((chick* OR hatch* OR fledg*) AND ((open* OR wide* OR unfurl* OR spread*) ws (wing* OR limb*)) AND (air ws stream)) AND (CPC:(A01K*) OR IC:(A01K*))	31	8-Jan-17
L22	TACD:((chick* OR hatch* OR fledg*) AND ((open* OR wide* OR unfurl* OR spread*) ws (wing* OR limb*)) AND ((strob* OR flash*) ws light*)) AND (CPC:(A01K*) OR IC:(A01K*))	16	8-Jan-17
L21	TACD:((chick* OR hatch* OR fledg*) AND (*balanc* OR destabiliz*) AND ((strob* OR flash*) ws light*)) AND (CPC:(A01K*) OR IC:(A01K*))	92	7-Jan-17
L20	TACD:((chick* OR hatch* OR fledg*) AND (*balanc* OR destabiliz*) AND ((strob* OR flash*) ws light*)) AND CPC:(A01K*)	69	7-Jan-17
L19	TACD:(((malform* OR deform* OR disabl* OR wound*) wp (chick* OR bird*) wp (detect* OR screen* OR determin*))) AND CPC:(A01K* OR A61B* OR A61D*)	249	5-Jan-17
L18	TACD:((day ws old ws (chick* OR bird*)) AND ((health* OR diseas* OR ill*) ws (detect* OR screen* OR determin*))) AND CPC:(A01K* OR A61B* OR A61D*)	285	5-Jan-17
L17	TACD:((day ws old ws (chick* OR bird*)) AND (health* OR diseas*) AND (imag* OR camera* OR photo*)) AND CPC:(A01K* OR A61B* OR A61D*)	371	5-Jan-17
L16	TACD:((day ws old ws (chick* OR bird*)) AND (health* OR diseas*)) AND CPC:(A01K*)	618	5-Jan-17
L15	TACD:((day ws (chick* OR bird*)) AND (health* OR diseas*)) AND CPC:(A01K*)	2166	5-Jan-17
L14	TACD:(((((librar* OR databas*) ws (imag* OR photo*)) wp compar*) AND (chick* OR bird* OR avian*) AND (health* OR diseas*)) AND CPC:(A01K*)	73	5-Jan-17

L13	TACD:(((((librar* OR databas*) ws (imag* OR photo*)) wp compar*) AND (chick* OR bird* OR avian*) AND (sex* OR female* OR male*)) AND CPC:(A01K*)	71	5-Jan-17
L12	TACD:(((((librar* OR databas*) ws (imag* OR photo*)) wp compar*) AND (chick* OR bird* OR avian*) AND (sex* OR female* OR male*))	1727	5-Jan-17
L11	TACD:(((librar* OR databas*) ws (imag* OR photo*)) AND (chick* OR bird* OR avian*) AND (sex* OR female* OR male*))	7128	5-Jan-17
L10	TACD:(((sex* OR female* OR male*) wp (determin* OR sens* OR detect* OR ascertain*)) AND computer AND (imag* OR camera* OR photo*) AND (databas* OR librar*)) AND CPC:(A01K45*)	76	3-Jan-17
L9	TACD:(((sex* OR female* OR male*) wp (determin* OR sens* OR detect* OR ascertain*)) AND computer AND (imag* OR camera* OR photo*) AND (databas* AND librar*)) AND CPC:(A01K45*)	1	3-Jan-17
L8	TACD:(((sex* OR female* OR male*) wp (determin* OR sens* OR detect* OR ascertain*)) AND (imag* OR camera* OR photo*) AND (databas* OR librar*)) AND CPC:(A01K45*)	87	3-Jan-17
L7	TACD:(((chick* OR hatch* OR fledg*) wp (sex* OR female* OR male*) wp (determin* OR sens* OR detect* OR ascertain*)) AND (imag* OR camera* OR photo*) AND (databas* OR librar*)) AND CPC:(A01K*)	564	2-Jan-17
L6	TACD:(((chick* OR hatch* OR fledg*) wp (sex* OR female* OR male*) wp (determin* OR sens* OR detect* OR ascertain*)) AND ((wing* OR limb*) ws (open* OR wide* OR unfurl* OR spread*)) AND (imag* OR camera* OR photo*) AND (databas* OR librar*)) AND CPC:(A01K*)	8	2-Jan-17
L5	TACD:(((chick* OR hatch* OR fledg*) wp (sex* OR female* OR male*) wp (determin* OR sens* OR detect* OR ascertain*)) AND ((wing* OR limb*) ws (open* OR wide* OR unfurl* OR spread*)) AND ((imag* OR camera* OR photo*) wp (databas* OR librar*)))	75	2-Jan-17
L4	TACD:(((chick* OR hatch* OR fledg*) wp (sex* OR female* OR male*) wp (determin* OR sens* OR detect* OR ascertain*)) AND ((wing* OR limb*) ws (open* OR wide* OR unfurl*)) AND ((imag* OR camera* OR photo*) wp (databas* OR librar*)))	73	2-Jan-17
L3	TAC:((chick* OR hatch* OR fledg*) AND (sex* OR female* OR male*) AND (determin* OR sens* OR detect* OR ascertain*) AND (wing* OR limb*) AND (open* OR wide* OR unfurl*) AND (imag* OR camera* OR photo*) AND (databas* OR librar*))	73	2-Jan-17

L2	TA:((chick* OR hatch* OR fledg*) AND (sex* OR female* OR male*) AND (determin* OR sens* OR detect* OR ascertain*) AND (wing* OR limb*) AND (open* OR wide* OR unfurl*) AND (imag* OR camera* OR photo*) AND (databas* OR librar*))	1	2-Jan-17
L1	AASN:(KARIMPOUR w1 Ramin) OR INV:(KARIMPOUR w1 Ramin)	24	2-Jan-17

Non-Patent Literature (NPL) Search Strategy/Results:

Google Scholar:

03 January 2016 (03.01.2017)

- Wing spreading chick sexing
- Feather sexing destabilize
- Database image compare chick sexing
- Library chicken feathers images
- Digital images chick sexing
- Air stream chick flapping
- Blowing air chick wing
- Puff air chick wing balance
- Strobe light chick
- Flashing light wing opening
- Detecting malformed chicks
- Screening health day old chick
- Deformity day old chick camera
- Database image breed chick disease
- Image chick breed health
- Day old chick health monitoring
- Sorting chicks health

PubMed:

03 January 2016 (03.01.2017)

- Chick feather sexing
- Day old chick health screening
- Camera database chick sexing

EBSCO:

03 January 2016 (03.01.2017)

- Chick camera sexing
- Database image sexing hatchling
- Health library images chick

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(54) **Title**: SYSTEM AND METHOD OF DETERMINING THE HEALTH & GENDER OF A CHICK

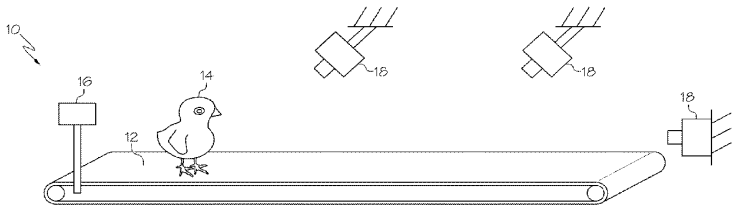


FIG. 1

(57) **Abstract**: A first system for determining the relative health of a chick having a first moving platform to support a chick, a first image capture device, a first database having a library of digital images relating to healthy and unhealthy chicks and a computer processor in communication with the image capture device and database. A second system for determining the gender of a chick includes a second moving platform, a second image capture device, stimuli directed at the chick to cause the chick to open its wings. The second system also includes a second database having wing patterns of male and female chicks of the breed of the chick on the second moving platform and a second computer processor in communication with the second image capture device and the second database.

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SYSTEM AND METHOD OF DETERMINING THE HEALTH & GENDER OF A CHICK

PRIORITY

This application claims priority from U.S. provisional patent application serial no. 62/254737, filed November 13, 2015, and U.S. provisional patent application serial no. 62/349,981 filed June 14, 2016. The contents of each are incorporated herein in their entirety.

FIELD

The embodiments described herein are directed to systems and methods for detecting the relative health and gender of a day old chick. With regard to unhealthy chicks, they are separated from the flock once any illness or injury is detected. With regard to gender determination, once detected, the chicks are separated by gender.

BACKGROUND

There are essentially three types of poultry that are processed in today's mass production environment: broilers, breeders and layers. The broilers are grown and slaughtered at maturity for human consumption. Breeders are raised to breed broilers or layers, and layers are raised to lay eggs for human and animal consumption. In each case, as chicks hatch, they are quickly processed and moved to the next stage of their life. Day old chicks are vulnerable to disease and infection. Due to the crowded conditions in which chicks hatch and live, any chick born with an abnormality or disease may be in a position to infect a multitude of other chicks in the surrounding area. Thus it is critical to the health of the flock to remove any chick having a disease or malformation that could cause illness to other chicks. Moreover, it is only humane to remove any seriously ill chicks or disabled chicks so that they can be humanely euthanized and disposed of before causing further injury to themselves.

Day old broiler chicks are processed quickly in hatcheries and are swiftly transported to "Growth Out Farms" where they will live and grow to desire weight for consumption. There are two common maladies that afflict some chicks. The first is a failure of the abdominal wall to close after absorption of the yolk sac. In such a case, the chick hatches with an open abdominal cavity. This condition is typically terminal. If left undetected for

any length of time, the open wound will attract unwanted bacteria and infection to the area and ultimately the death of the chick.

The second affliction is a malformed or disabled leg or foot or malformed beak or eye. Chicks with malformed legs and feet are unable to withstand the rigors of a mass farming environment, get adequate feed, and water in "Growth Out Farm" and consequently never grow as well as their healthy counterparts. Thus, they need to be removed as quickly as possible.

Thus, there is a need to quickly and efficiently inspect day old chicks to determine whether or not they are sufficiently healthy to withstand the rigors of the poultry production environment. In addition, there is a need to quickly and efficiently detect any physical abnormalities in day old chicks so that those with such abnormalities may be separated from the otherwise healthy flock.

Early gender determination of a chick is also important in poultry production to ensure that the sexes are separated out as soon as possible to ensure efficient investment of appropriate resources. Layer males have no value and similarly a limited number of breeder males are necessary. In the case of the broilers, male broilers are less desirable. The Feed Conversion Ratio (FCR), or cost of feed per weight gained is the main driver for the lack of favorability of broiler males.

Determining the gender of a day old chick has been a common practice in the poultry industry since the early 1900's. Manual vent and feather sexing have been used over the years by the industry to separate male and female chicks. Both methods are considered to be unfriendly to chicks based on the manual handling of the chicks, and increase the seven-day mortality of sexed chicks.

It is known that the gender of a day old chick can be determined by the chick's wing feathers. The feather pattern and length at the bend in the wing vary between male and female day old chicks. However, the present method of manually causing the chick's wings to spread increases the chick's chances for disease and injury. Moreover, the manual methodologies are labor intensive and are likely to cause repetitive injuries to the workers over time.

Thus, there is a need to quickly and automatically inspect day old chicks to determine their sex and subsequently separate them by sex.

SUMMARY

The embodiments described herein include a system having a device for positioning a chick on a moving platform, and an image capturing device to capture at least one electronic image of the chick on the moving platform. The system further includes a database containing electronic images of healthy and unhealthy chicks within the chick's breed, and an image processor in communication with the image capture device and the database. When the captured image of the chick is sent to the image processor, it is compared to the database of chick images and if the image of the chick deviates from the images of healthy chicks in the database or matched with images of unhealthy chicks or presents any anomalies, the chick is separated from the flock.

The positioning device may be a conveyor. The image taken of the chick may be a frontal image. The image taken of the chick may be of its torso. The image taken of the chick may be of its legs, face and feet.

The embodiments herein described further include a method for determining the health of a day old chick including the steps of positioning a chick on a moving platform and capturing at least one electronic image of the chick on the moving platform. The method also includes providing a database containing electronic images of healthy chicks within the chick's breed and providing an image processor in communication with the image capture device and the database. The method further includes comparing the captured image with the electronic images in the database and determining if the captured image deviates from those in the database.

The embodiments described herein further include a system having a device for causing a chick to spread its wings, and an image capturing device to capture at least one electronic image of the chick's wings as they are spread. The system further includes a database containing electronic images of male and female wing patterns within the chick's breed, and an image processor in communication with the image capture device and the database. When the captured image of the chick's wings is sent to the image processor, it is

compared to the database of chick wing patterns for the breed to determine the gender of the chick.

The device for causing a chick to spread its wings is preferably an angled conveyor or hinged platform. The image capture device may be a digital camera. The image taken of the chick may be a front view image.

The embodiments herein also describe a method for determining the gender of a chick including the steps of providing a moving platform to support a chick, introducing at least one stimuli to cause the chick to spread its wings and capturing at least one image of the chick as it spreads its wings. The method further includes providing a database having a library of digital images therein and providing a computer processor in communication with the image capture device and the database. After the chick spreads its wings, an image is taken of the wings. The image of the chick's wing is compared to the library of digital images to determine the gender of the chick.

DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the embodiments will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

Fig. 1 is a perspective view of a portion of the first embodiment;

Fig. 2 is a side schematic view of the first embodiment;

Fig. 3. is an enlarged perspective view of the first angled conveyor of the first embodiment;

Fig. 4 is an enlarged side schematic view of a portion of the first embodiment of Fig. 2;

Fig. 5 is diagrammatic representation of the actuator of the first embodiment in both extended and retracted positions;

Fig. 6 is an enlarged perspective view of the second angled conveyor of the first embodiment;

Fig. 7 is a diagrammatic representation of the communication of various elements of the first embodiment; and

Fig. 8 is a side schematic view of the first embodiment in Fig. 6.

The embodiments herein described are not intended to be limiting. It is intended that the embodiments shall cover all alternatives, modifications, and equivalents as defined herein.

DESCRIPTION

The embodiments herein focus on a system and method for determining the relative health and gender of a chick. The first embodiment 10, shown in Fig. 1 includes a first conveyor 12 that moves the chicks 14 in the hatchery. It should be appreciated that the chicks 14 have been previously separated by other conveyors and dividers and are now travelling along the first conveyor 12 in single file fashion. The first conveyor 12 has a presence sensor 16 to sense the presence of a chick 14 on the first conveyor. One or more cameras 18 are located along the pathway of the first conveyor 12. It is preferred that the cameras 18 be located at the end of the conveyor level with the body of the chick 14 so as to be able to focus on the chick's abdomen, legs and feet. In addition, cameras 18 may be mounted overhead the first conveyor 12 to be able to focus on the chick but not interfere with the chick's travel along the first conveyor. The term conveyor is understood to mean any type of handling mechanism capable of transporting an object, in this case an animal, from a first location to a second location. The term conveyor shall include but not be limited to conveyor belts, moving platforms and the like.

The cameras 18 are preferably video cameras that can take live video footage of each chick 14 as it travels along the first conveyor 12. The cameras 18 are in communication with master system controller 44 and a computer processor 32 (Fig. 7). The computer processor 32 includes a database of images of healthy and unhealthy chicks 14. The computer processor 32 is designed to receive and process the images from the cameras 18 and determine whether or not the chick images show any signs of abnormalities or irregularities that warrant further attention. The details of this process will be discussed below.

As shown in Fig. 2, an angled conveyor 20 is positioned adjacent to and below the first conveyor 12. The first angled conveyor 20 is oriented at an angle θ to the horizon.

The first angled conveyor 20 has a near end 22 and a far end 24. The angled conveyor 20 has a frame 26 to support the angled conveyor (Fig. 4). The frame 26 of the angled conveyor 20 is rotatably connected at the near end 22 to a fixed structure such as the frame structure of the overall system. The frame 26 supports a pair of rails 28 that prevent the chick from falling off of the angled conveyor 20.

An actuator 30, shown in Figs. 3-5, is fixedly connected to the frame 26 of the angled conveyor 20 and also to a support structure such as the frame structure of the overall system. The actuator 30 is positioned normally to support the angled conveyor 20 in an extended position. When activated, the actuator 30 retracts causing the frame 26 of the angled conveyor 20 to pivot about its near end 22 and swing the far end 24 further downward increasing the angle θ. The actuator 30 is in communication with the computer processor 32 that controls the actuator remotely.

Returning to Fig. 2, a third conveyor 34 is located below angled conveyor 20 and is positioned to receive chicks 14 therefrom when the angled conveyor is in its extended position. A fourth conveyor 36 is located further below the angled conveyor 20 and is oriented perpendicularly to the angled conveyor 20, when contracted. The fourth conveyor 36 receives chicks 14 from the angled conveyor 20 when it is retracted by the actuator 30, which will be discussed in more detail below.

A second angled conveyor 38, shown in Fig. 2 and 6, is located immediately below the third conveyor 34 to receive chicks 14 therefrom. A second presence sensor 40 is located at the end of the third conveyor 34. The second presence sensor 40 senses the presence of a chick 14 along the pathway of the second angled conveyor 38.

Cameras 18 are positioned at the end of the third conveyor 34 and at one or more points along the pathway of the second angled conveyor 38 (Fig. 6). The cameras 18 are positioned to focus on the wing pattern of the chicks 14 as they pass.

Fans 42 are located along the pathway of second angled conveyor 38 (Fig. 6). The fans 42 are positioned so as to direct air upwards as the chick 14 passes. Fan activation is controlled by the master control system 44. The master control system is in communication with the computer processor 32 (Fig. 7).

A vibrating mechanism 46, shown in Figs. 6 is fixed to the second angled conveyor 38. During use, the vibrating mechanism 46 causes the second angled conveyor 38 to vibrate. The vibrating mechanism 46 is in communication with the master control system 44. A

strobe light 47 is positioned towards the end and above the pathway of the conveyor 38. The strobe light 47 is also in communication with the master controller 44.

As shown in Fig. 2, a fifth conveyor 48 is located at the end of the second angled conveyor 38. The fifth conveyor 48 receives those chicks 14 coming off of the second angled conveyor 38. A sixth conveyor 50 is positioned directly below and perpendicular to the second angled conveyor 38. The sixth conveyor 50 receives those chicks 14 who are moved off of the second angled conveyor 38 when it is in its retracted positon. This process will be explained in more detail below.

The computer processor 32 includes a database having a library of digital images of the wing patterns of chicks of a variety of chicken breed stored therein. The computer processor 32 (Fig. 7) is also in communication with the second presence sensor 40, cameras 18, and actuator 30 (Fig. 6) via the master control system 44. Moreover, the computer processor 32 is also in communication with a master control system 44 which controls the speed of the conveyors and controls the overall function of operation. The master control system 44 is in electronic communication with the cameras 18, fans 42 and vibrating mechanism 46 (Fig. 6) such that the start and stop of each of the aforementioned may be controlled by the master control system. A diagrammatic representation of the communication between the aforementioned elements is shown in Fig. 7.

In use, after the chicks 14 hatch, they are initially processed and eventually moved onto the first conveyor 12. It should be noted that there may be a series of other conveyors - and dividers and the like (not shown) that may be used to move the newly hatched chick 14 to the conveyor 12. However, such equipment and logistics are not discussed herein.

As the chick 14 travels along the first conveyor 12, first presence sensor 16 detects the presence of a chick travelling along the first conveyor 12 (Fig. 2). The presence sensor 16 communicates with the computer processor 32 which activates the cameras 18 positioned at the end of and above the pathway of the first conveyor 12 and along the angled conveyor 20 (Fig. 3). The cameras 18 takes at least one image of the chick. Preferably the camera 18 is able to take video feed of the chick's abdomen, legs, facial features and feet.

The image or images are electronically communicated to the computer processor 32 (Fig. 7). The computer processor 32 processes the images and compares them with those images in its database of healthy and unhealthy chicks of the same breed. In comparing the camera images with the digital image library, the computer processor 32 is able to detect any abnormalities or deviations in the images taken from standard images in the database. If there is a deviation detected in the image taken, the computer processor 32 registers such a deviation as an abnormality or affliction that needs closer attention.

The computer processor thus communicates its finding with the master control system 44 (Fig. 4), which activates the actuator 30. This causes the near end 22 of the first angled conveyor 20 to pivot and the far end 24 to swing downwardly increasing the angle θ. At a certain angle θ, the chick 14 cannot remain on the first angled conveyor and is dropped onto the fourth conveyor 36 (Fig. 2) for further manual inspection. If the chick is unhealthy, it will be separated from the otherwise healthy flock. If the chick is, in fact, healthy, it will be returned to the flock for further processing.

Once the chick has been transferred to the fourth conveyor 36, the actuator 30 (Fig. 5) is reversed and causes the first angled conveyor 20 to return to its extended position. This results in the far end 24 of the first angled conveyor 20 swinging upwardly as the near end 22 pivots about itself and the angle θ declines. Once the actuator has returned the first angled conveyor 20 to its original position, it is ready to receive another chick 14. In this manner, only healthy chicks are permitted to advance to the third conveyor 34.

Once a healthy chick has progressed to the third conveyor 34, the second presence sensor 40 (Fig. 6) detects its presence on the third conveyor 34. The second presence sensor 40 communicates with the computer processor 32 and master control system 44 (Fig. 7) to activate the cameras 18, fans 42, strobe light 47 and vibrating mechanism 46 adjacent to the second angled conveyor 38.

At the end of travel along the third conveyor 34, the chick moves onto the second angled conveyor 38. At this time, the chick encounters the second angled conveyor 38 with air blowing upwardly from its feet towards its face and head created by the fans 42. In addition, the surface of the second angled conveyor 38 is vibrating as a result of the

activation of the vibrating mechanism 46. The upwardly blowing air and vibrating surface cause the chick to feel unbalanced. In an effort to regain its balance, the chick begins to lift and flap its wings. As it does the cameras 18 take images of the opened wing pattern. The flashing of the strobe light 47 is also expected to have a similar stimuli effect on the chick.

The images are communicated with the computer processor 32 (Fig. 7) which processes the images and compares them to images of male and female wing patterns within its database for chicks of that breed. In comparing the images, the computer can determine the gender of the chick at issue. If the computer processor 32 determines the chick to be a female, the chick is allowed to proceed to the fifth conveyor 48 where it is crated and transferred to a growing farm. If the chick is determined to be a male, the computer processor 32 activates the actuator 30 which retracts and causes the second angled conveyor 38 to pivot and the far end 20 to swing downwardly increasing the angle θ. At a certain angle θ, the chick 14 cannot remain thereon and is dropped onto an alternate conveyor 50 for further processing. Chicks will be separated by sex and processed separately.

Once the male chick 14 has been transferred to an alternate platform, the master control system 44 deactivates the actuator 30 (Fig. 6). This causes the second angled conveyor 38 to return to its extended position. This results in the far end 20 of the second angled conveyor 38 swinging upwardly as the near end 18 pivots about itself and the angle θ declines. Once the actuator 30 has returned the second angled conveyor 38 to its original position, it is ready to receive another chick.

Thus it is apparent that the embodiments herein provided fully satisfy the objects, aims and advantages set forth above. It is evident that many alternatives, modifications and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly it is intended to embrace all such alternatives, modifications, and variations as fall within the spirit and scope of the appended claims.

CLAIMS

What is claimed is:

1. A system for determining the sex of a chick comprising:

a moving platform to support a chick;

at least one stimuli to cause the chick to open its wings;

an image capture device to capture at least one image of the chick;

a database having a library of digital images; and

a computer processor in communication with the image capture device and the database, whereby the image of the chick is compared to the library of digital images to determine the sex of the chick.

2. The system of claim 1 further comprising a master control system in communication with the camera, moving platform, database, computer processor and moving platform.

3. The system of claim 1 wherein the stimulus is an angled conveyor belt.

4. The system of claim 1 wherein the stimulus is a vibrating conveyor belt.

5. The system of claim 1 wherein the stimulus is a strobe light.

6. The system of claim 1 wherein the stimulus is a stream of air blowing on the chick.

7. The system of claim 1 wherein the library of digital images is particular to the chick's breed.

8. The system of claim 5 wherein the digital images are wing patterns.

9. A system for determining the health of a day old chick comprising:

a moving platform upon which a chick is positioned;

image capturing device to capture at least one electronic image of the chick on the moving platform;

a database containing electronic images of healthy and unhealthy chicks within the chick's breed;

computerized image processor in communication with the image capture device and the database, whereby the captured image of the chick is sent to the computerize image processor where it is compared to the database and if the image of the chick deviates from the images in the database, the moving chick is separated out from the flock.

10. The system of claim 9 wherein the image is that of the feet, face and legs.

11. The system of claim 9 wherein the image captured is that of the abdomen.

12. The system of claim 1 further comprising a device for altering the platform's position.

13. A system for determining the health and gender of a day old chick comprising:

a first moving platform upon which a chick is positioned;

first image capturing device to capture at least one digital image of the chick on the first moving platform;

a first database containing digital images of healthy and unhealthy chicks within the chick's breed;

second moving platform;

at least one stimuli applied to the second moving platform;

second image capture device to capture a second digital image of the chick on the second moving platform;

second database containing digital images of wing patterns for each gender of chick;

computerized image processor in communication with the first and second image capture devices, and first and second databases,

whereby the captured first image of the chick is processed by the computerize image processor where it is compared to the first database and healthy chicks are separated from any unhealthy chicks, and the healthy chicks move to the second moving platform where the captured second image of the healthy chick is processed by the computerize image processor where it is compared to the second database to determine the gender of the chick and the chicks are separate by gender.

14. The system of claim 13 wherein the chicks are separated by a position altering device.

15. The system of claim 14 wherein the position altering device comprises an angled conveyor actuated to pivot about one end so that the chick on the angled conveyor can no longer remain thereon and drops to a different surface.

16. The system of claim 13 wherein the stimuli include but are not limited to forced air, strobe lighting, and vibration applied to the second moving platform.

17. The system of claim 13 wherein the first image capture device captures images of the chick's abdomen, legs or feet.

18. The system of claim 13 wherein the chick is less than one day old.

19. The system of claim 13 wherein the first or second moving platform is angled.

20. The system of claim 13 wherein the digital images captured by the second image capture device are the chick's wings.

5

Exhibit 1002 (page 496)

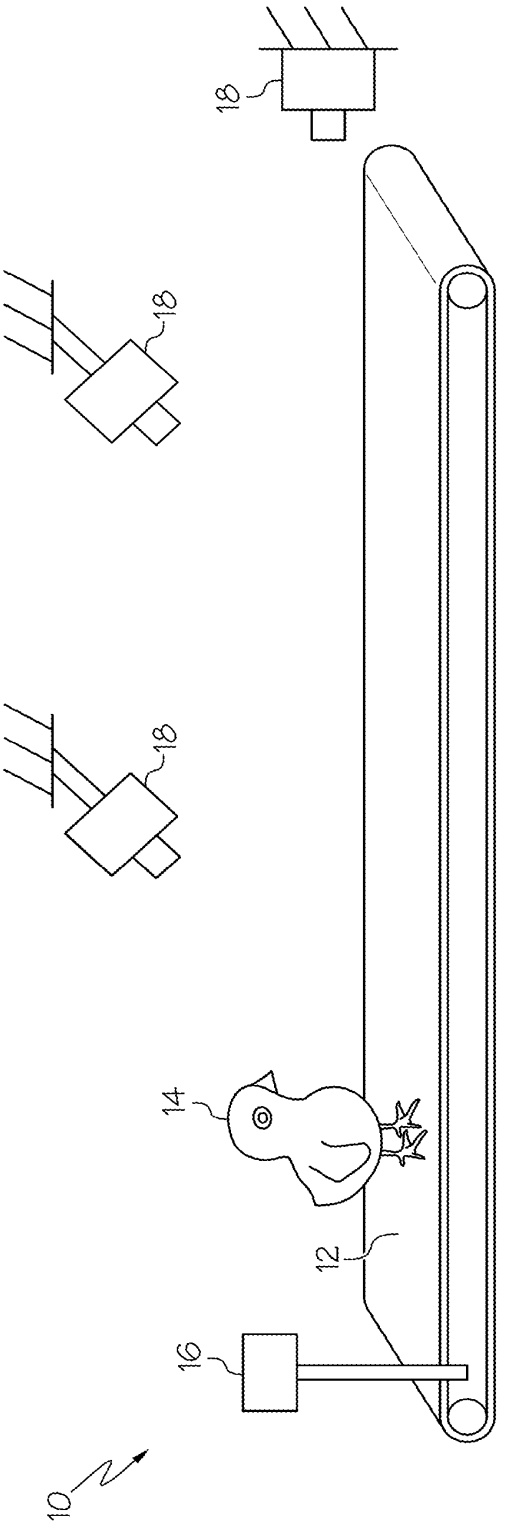


FIG. 1

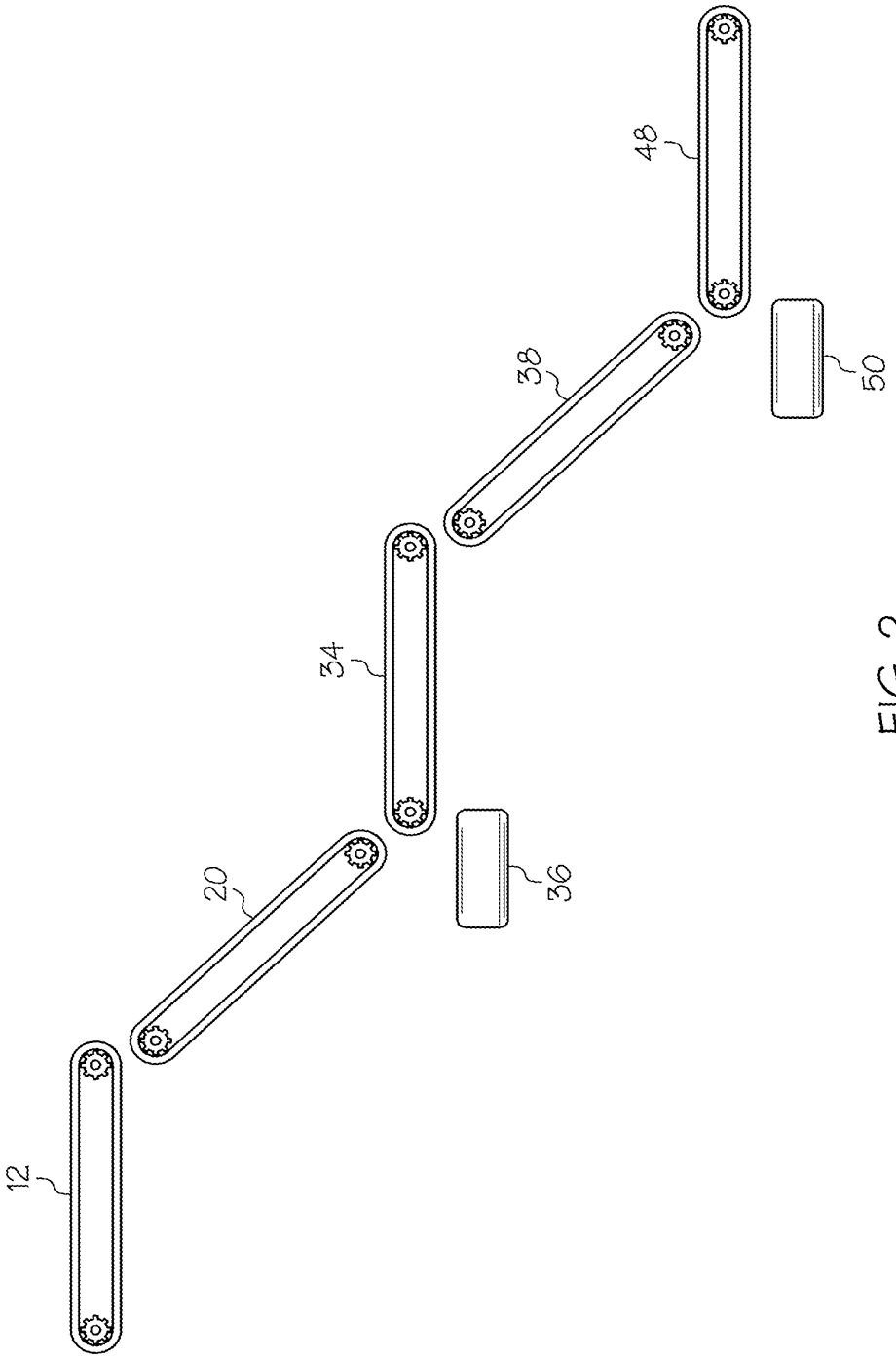


FIG. 2

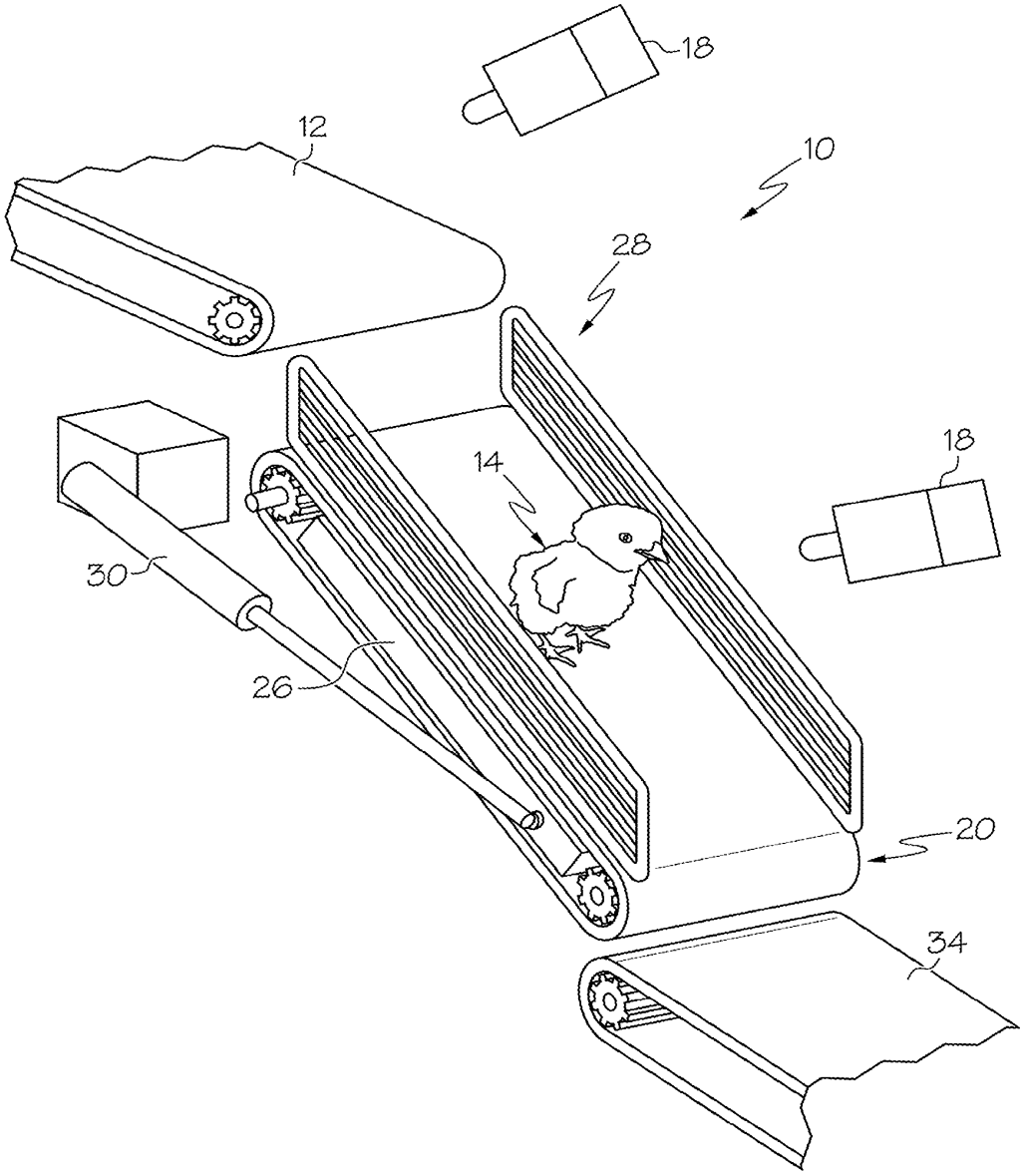


FIG. 3

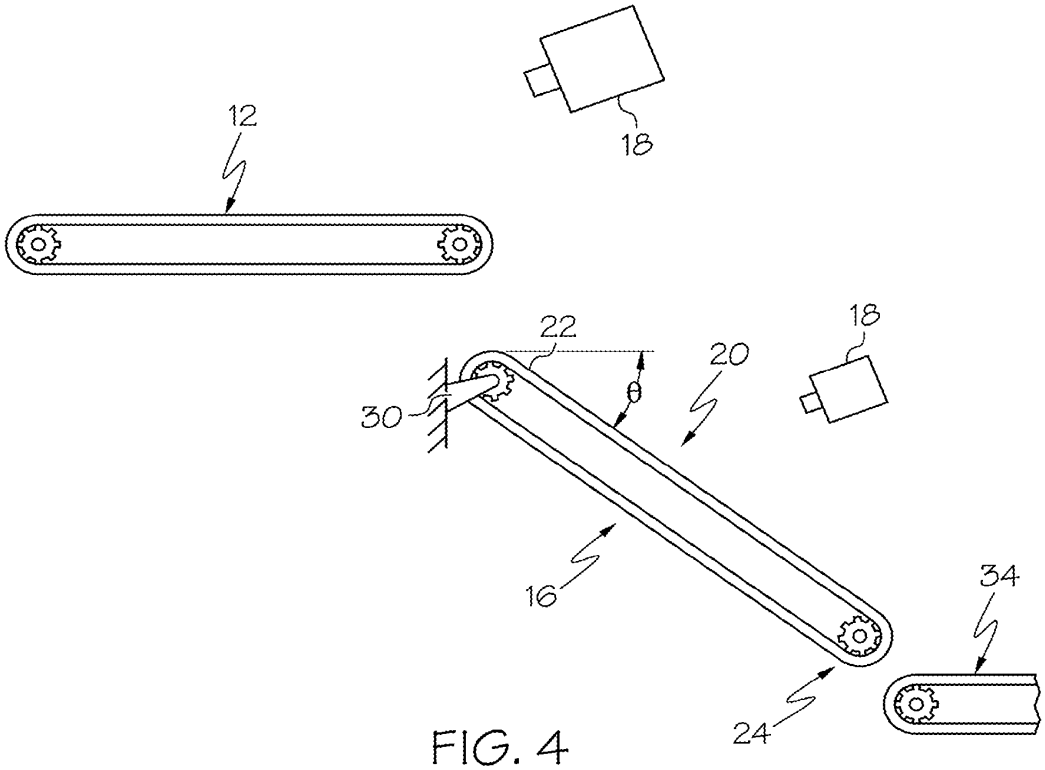


FIG. 4

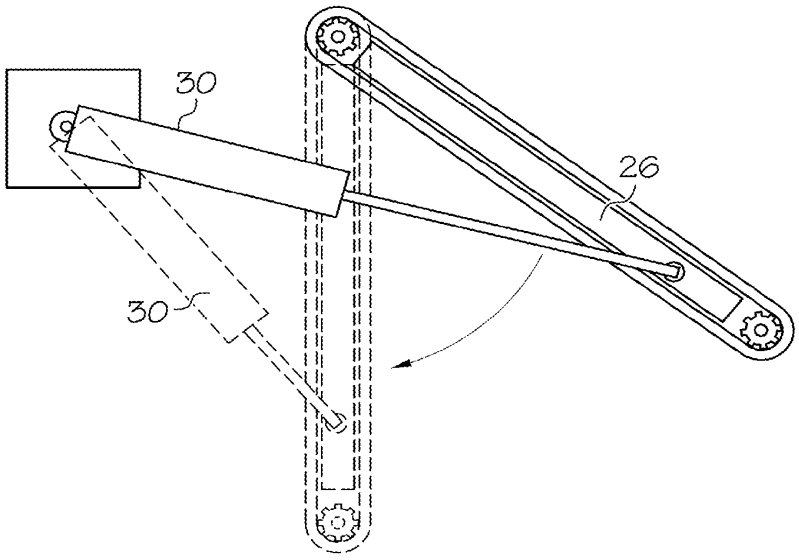


FIG. 5

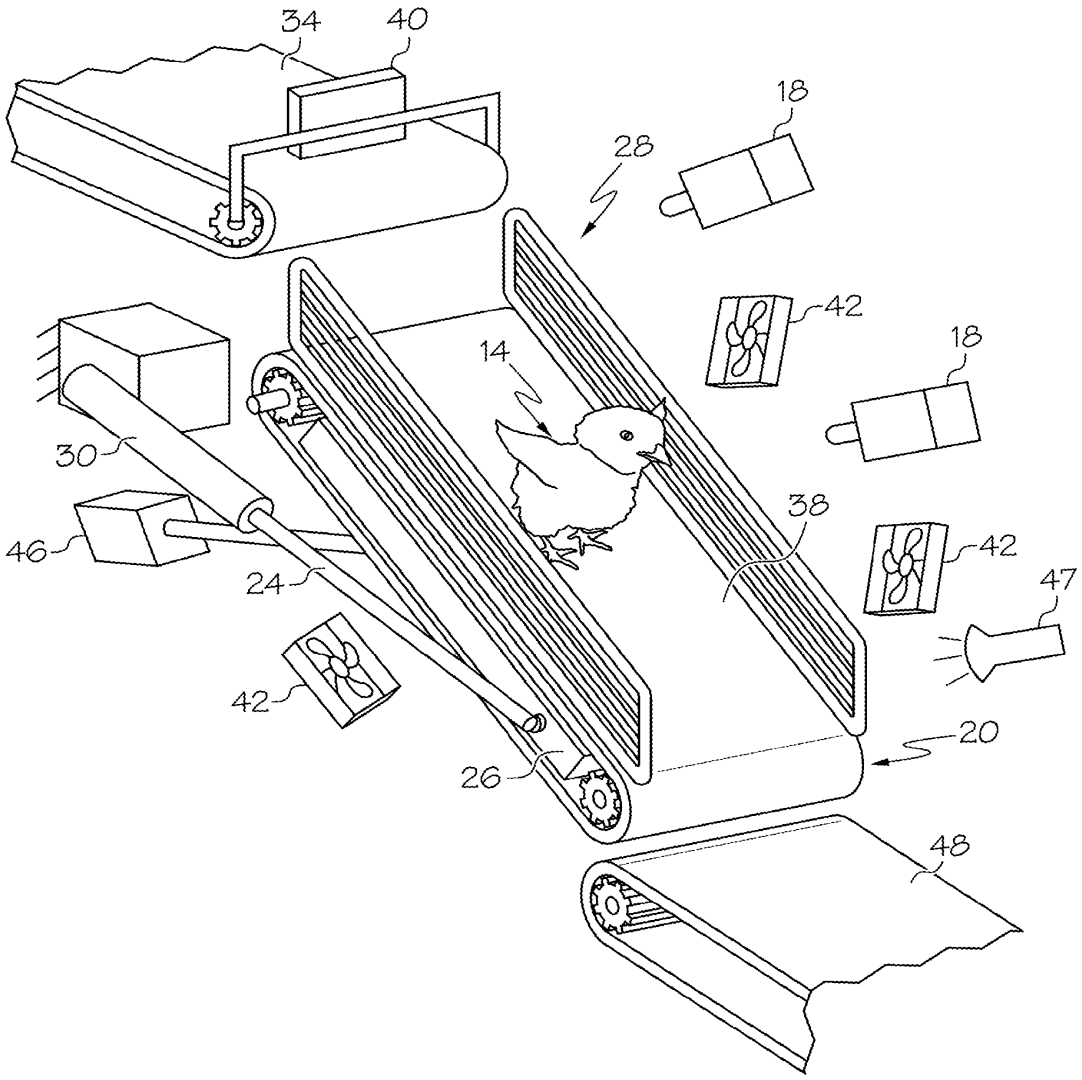


FIG. 6

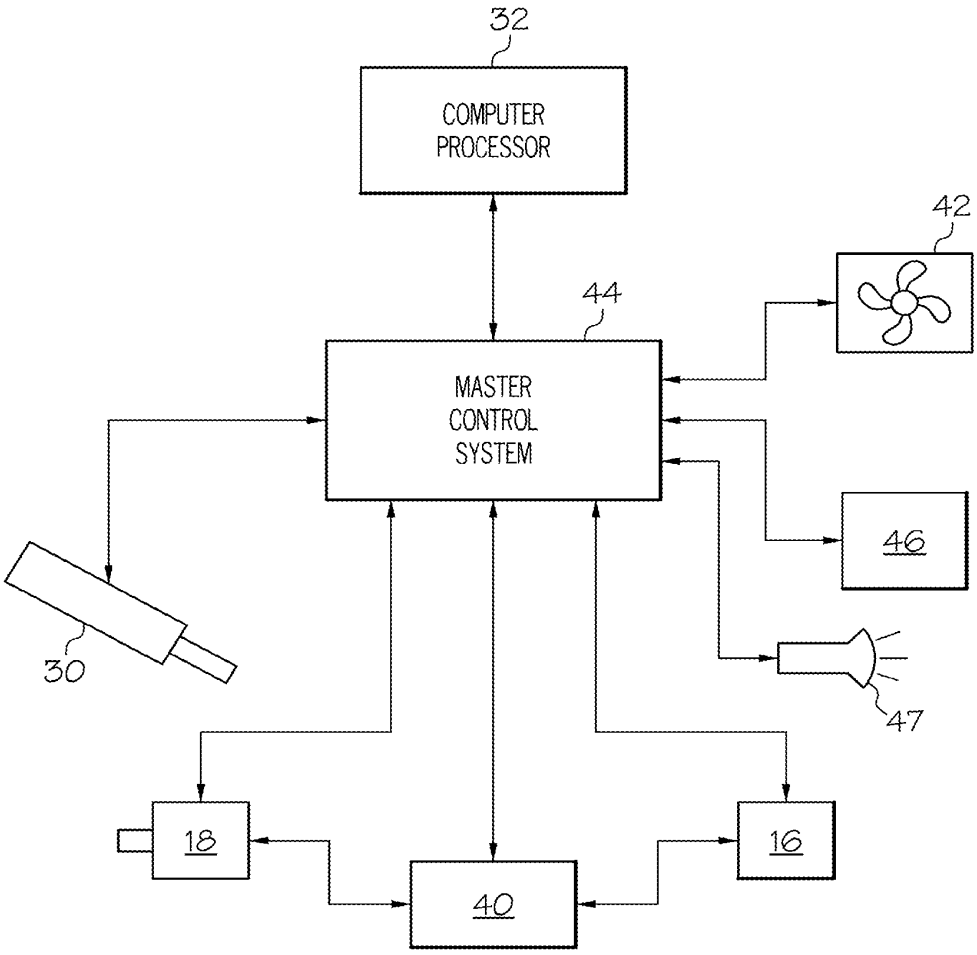

32
COMPUTER PROCESSOR
42
44
MASTER CONTROL SYSTEM
46
30
47
18
16
40

FIG. 7

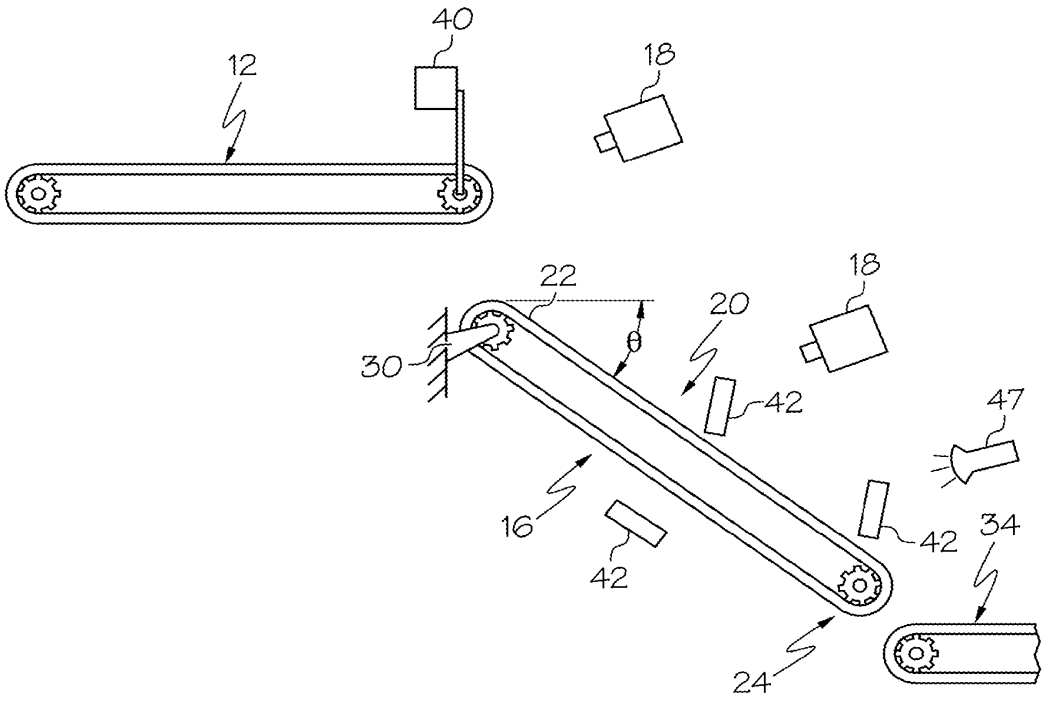


FIG. 8

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: Ramin Karimpour

Serial No.:

Title: System and Method for Determining the Health and Gender of a Chick

---

Mail Stop: Amendments

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

PRELIMINARY AMENDMENT

Claims 1-20 are presently pending. Please cancel claims 3-6, and 11-20. Please add claims 21-34.

Claim amendments begin on page 2.

Comments begin on page 6.

A clean copy of the claims is attached hereto.

Please add claims 21-34.

1. (Currently amended) A system for determining the sex of a chick comprising:
a moving platform to support a chick;
at least one stimuli to cause the chick to open its wings;
an image capture device to capture at least one image of the chick;
~~a database having a library of digital images;~~ and
a computer processor in communication with the image capture device ~~and the database~~,
whereby the image capture device captures at least one image of the chick and transmits it to the computer processor where the image is ~~compared to the library of digital images~~ processed and the computer processor calculates a level of deviation of the image ~~to determine the sex of the chick~~.

2. (Currently amended) The system of claim 1 further comprising a master control system in communication with the camera, moving platform, ~~database~~, and computer processor ~~and moving platform~~.

3. The system of claim 1 wherein the stimulus may be one or more of the following group: ~~is~~ an angled conveyor belt, a vibrating conveyor belt, a strobe light, or a stream of air blowing on the chick.

4.- 6. Cancelled

7. (Currently amended) The system of claim 1 ~~wherein the~~ further comprising a database having a library of digital images ~~is particular to the chick's breed~~.

8. (Currently amended) The system of claim 7 ~~5~~ wherein the digital images are wing patterns.

9. (Currently amended) A system for determining the health of a day old chick comprising:

a moving platform upon which a chick is supported ~~positioned~~;

image capturing device to capture at least one electronic image of a predetermined area of the chick ~~on the moving platform~~;

~~a database containing electronic images of healthy and unhealthy chicks within the chick's breed~~;

computerized image processor in communication with the image capture device ~~and the database~~, whereby the image capture device captures at least one ~~the captured~~ image of the chick, and it is transmitted ~~sent~~ to the ~~computerize~~ computerized image processor where ~~it is compared to the database~~ the computerized image processor determines the level of deviation of ~~and if~~ the image of the chick ~~deviates from the images in the database, the moving chick is separated out from the flock~~.

10. (Currently amended) The system of claim 9 wherein the ~~image~~ predetermined area is that of the feet, face, abdomen or ~~and~~ legs.

11-20 Cancelled

21. (New) A system of sorting chicks on the basis of a predetermined feature of a chick comprising:
a moving platform to support a chick;
an image capture device positioned proximate to the moving platform to capture at least one image of the chick as it passes on the moving platform;
a computer processor in communication with the image capture device, the computer processor capable of processing images and determining deviation from a predetermined value; and
removing means for removing a chick from the moving platform, the removing means in communication with the computer processor, whereby when the image capture device takes an image of the chick and transmits it to the computer processor, the computer processor processes the image and determines the level of deviation of the chick's predetermined feature, if the level

of deviation exceeds a predetermined value, the computer processor communicates with the removing means to remove the chick from the moving platform.

22. (New) The system of claim 21 further comprising a database having a library of digital images of a predetermined feature of the chick

23. (New) The system of claim 22 wherein the level of deviation is determined from a comparison of the captured image to the library of digital images.

24. (New) The system of claim 21 wherein the predetermined feature is the wing, the abdomen, or the foot.

25. (New) The system of claim 22 wherein the library of digital images is limited to those of the chick's breed.

26. (New) The system of claim 21 further comprising a removing device in communication with the computer processor and activated when the computer processor determines the level of deviation of a chick exceeds a predetermined range, the removing device removes a chick having a variance exceeding the predetermined range from the moving platform.

27. (New) The system of claim 21 further comprising at least one stimuli proximate to the moving platform.

28. (New) The system of claim 27 wherein the stimulus may be one or more of the following group: an angled conveyor belt, a vibrating conveyor belt, a strobe light or a stream of air blowing on the chick.

29. (New) The system of claim 9 further comprising a database having a library of digital images, the database in communication with the computer processor.

30. (New) The system of claim 29 wherein the level of deviation is determined by comparing the image captured by the image capture device to the library of digital images.

31. (New) The system of claim 7 wherein the database has images particular to the chick's breed.

32. (New) The system of claim 1 further comprising a removing device in communication with the computer processor, whereby when the computer calculated level of deviation exceeds a predetermined range, the removing device is activated and removes a chick having a variance exceeding the predetermined range from the moving platform.

33. (New) The system of claim 9 further comprising a removing device in communication with the computerized image processor, whereby when the calculated level of deviation exceeds a predetermined range, the removing device is activated and removes a chick having a variance exceeding the predetermined range from the moving platform.

34. (New) The system of claim 26 wherein the removing device comprises a moving platform position altering device.

REMARKS

Claims 1-20 are presently pending in this application. Claims 3-6, 11-20 have been cancelled. Claims 21-33 have been added. A marked-up version of the claims is provided on pages 2-5 and a clean copy of the claims is attached.

The Office is respectfully invited to contact the undersigned at (919) 469-5685 to discuss any matter relating to this application.

Respectfully submitted,
/Kathleen Lynch/
Kathleen M. Lynch
Reg. No. 33957

Date: May 11, 2018

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www.lynchvansickle.com

CLAIMS-CLEAN COPY

1. (Currently amended) A system for determining the sex of a chick comprising:
a moving platform to support a chick;
at least one stimuli to cause the chick to open its wings;
an image capture device to capture at least one image of the chick; and
a computer processor in communication with the image capture device, whereby the image capture device captures at least one image of the chick and transmits it to the computer processor where the image is processed and the computer processor calculates a level of deviation of the image.

2. (Currently amended) The system of claim 1further comprising a master control system in communication with the camera, moving platform, and computer processor.

3. The system of claim 1 wherein the stimulus may be one or more of the following group: an angled conveyor belt, a vibrating conveyor belt, a strobe light, or a stream of air blowing on the chick.

4.- 6. Cancelled

7. (Currently amended) The system of claim 1 further comprising a database having a library of digital images.

8. (Currently amended) The system of claim 7 wherein the digital images are wing patterns.

9. (Currently amended) A system for determining the health of a day old chick comprising:

a moving platform upon which a chick is supported;

image capturing device to capture at least one electronic image of a predetermined area of the chick;

computerized image processor in communication with the image capture device, whereby the image capture device captures at least one image of the chick, and it is transmitted to the computerized image processor where the computerized image processor determines the level of deviation of the image of the chick.

10. (Currently amended) The system of claim 9 wherein the predetermined area is that of the feet, face, abdomen or legs.

11-20 Cancelled

21. (New) A system of sorting chicks on the basis of a predetermined feature of a chick comprising:
a moving platform to support a chick;
an image capture device positioned proximate to the moving platform to capture at least one image of the chick as it passes on the moving platform;
a computer processor in communication with the image capture device, the computer processor capable of processing images and determining deviation from a predetermined value; and
removing means for removing a chick from the moving platform, the removing means in communication with the computer processor, whereby when the image capture device takes an image of the chick and transmits it to the computer processor, the computer processor processes the image and determines the level of deviation of the chick's predetermined feature, if the level of deviation exceeds a predetermined value, the computer processor communicates with the removing means to remove the chick from the moving platform.

22. (New) The system of claim 21 further comprising a database having a library of digital images of a predetermined feature of the chick

23. (New) The system of claim 22 wherein the level of deviation is determined from a comparison of the captured image to the library of digital images.

24. (New) The system of claim 21 wherein the predetermined feature is the wing, the abdomen, or the foot.

25. (New) The system of claim 22 wherein the library of digital images is limited to those of the chick's breed.

26. (New) The system of claim 21 further comprising a removing device in communication with the computer processor and activated when the computer processor determines the level of deviation of a chick exceeds a predetermined range, the removing device removes a chick having a variance exceeding the predetermined range from the moving platform.

27. (New) The system of claim 21 further comprising at least one stimuli proximate to the moving platform.

28. (New) The system of claim 27 wherein the stimulus may be one or more of the following group: an angled conveyor belt, a vibrating conveyor belt, a strobe light or a stream of air blowing on the chick.

29. (New) The system of claim 9 further comprising a database having a library of digital images, the database in communication with the computer processor.

30. (New) The system of claim 29 wherein the level of deviation is determined by comparing the image captured by the image capture device to the library of digital images.

31. (New) The system of claim 7 wherein the database has images particular to the chick's breed.

32. (New) The system of claim 1 further comprising a removing device in communication with the computer processor, whereby when the computer calculated level of deviation exceeds a predetermined range, the removing device is activated and removes a chick having a variance exceeding the predetermined range from the moving platform.

33. (New) The system of claim 9 further comprising a removing device in communication with the computerized image processor, whereby when the calculated level of deviation exceeds a predetermined range, the removing device is activated and removes a chick having a variance exceeding the predetermined range from the moving platform.

34. (New) The system of claim 26 wherein the removing device comprises a moving platform position altering device.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	System and Method of Determining the Health and Gender of a Chick
First Named Inventor/Applicant Name:	Ramin Karimpour
Filer:	Kathleen M. Lynch
Attorney Docket Number:	374-2

Filed as Small Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
BASIC NATIONAL STAGE FEE	2631	1	150	150
NATL STAGE SEARCH FEE - U.S. WAS THE ISA	2641	1	70	70
NATL STAGE EXAM FEE - ALL OTHER CASES	2633	1	380	380
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**600**

Electronic Acknowledgement Receipt	
EFS ID:	32604581
Application Number:	15775706
International Application Number:	PCT/US2016/061536
Confirmation Number:	3566
Title of Invention:	System and Method of Determining the Health and Gender of a Chick
First Named Inventor/Applicant Name:	Ramin Karimpour
Customer Number:	90741
Filer:	Kathleen M. Lynch
Filer Authorized By:	
Attorney Docket Number:	374-2
Receipt Date:	11-MAY-2018
Filing Date:	
Time Stamp:	16:44:47
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$600
RAM confirmation Number	051418INTEFSW16460900
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	WebADS.pdf	122331 2d2683374933aba1268ef092e67238772a698017	no	8
Warnings:					
Information:					
2	Transmittal Letter	Transmittalflat.pdf	266783 1ea5cf9c9f8facda2bc11bb1dedc1364a379acfe	no	4
Warnings:					
Information:					
3	Documents submitted with 371 Applications	PCTPublicationHealthyChick.pdf	803155 8c9197f4a59f1e4b3a643d81fcd797f61592b99e	no	23
Warnings:					
Information:					
4	Assignee showing of ownership per 37 CFR 3.73	AssignmentofPatentApplicationsMar2018.pdf	1004046 a68de56edb24dc588e33b651da53b3e625d9b217	no	2
Warnings:					
Information:					
5	Oath or Declaration filed	Declarationex.pdf	1381927 0d8e0a7718993f2f6c9fae9b8d062cc5e1857022	no	2
Warnings:					
Information:					
6	Preliminary Amendment	PrelimAmend.pdf	93775 38974f54d9240ead1d475d88df8cbb1223ad6e35	no	10
Warnings:					
Information:					

7	Fee Worksheet (SB06)	fee-info.pdf	35328 0b1eeee4e4a1431b05203b3398d7dce669df7fac	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	3707345	

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New Applications Under 35 U.S.C. 111
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.
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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	374-2
	Application Number	
Title of Invention	System and Method of Determining the Health and Gender of a Chick	

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

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ramin		Karimpour	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Raleigh	State/Province	NC	Country of Residence i	US

Mailing Address of Inventor:

Address 1	2804 Glen Burnie Drive		
Address 2			
City	Raleigh	State/Province	NC
Postal Code	27607	Country i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

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	90741		
Email Address	kml@lynchvansickle.com	Add Email	Remove Email

Application Information:

Title of the Invention	System and Method of Determining the Health and Gender of a Chick		
Attorney Docket Number	374-2	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	7	Suggested Figure for Publication (if any)	3

PTO/AIA/14 (08-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	374-2
	Application Number	
Title of Invention	System and Method of Determining the Health and Gender of a Chick	

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	90741		

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	Remove
Registration Number					
Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	Remove
Registration Number					

Additional Representative Information blocks may be generated within this form by selecting the **Add** button.

PTO/AIA/14 (08-15)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	374-2
	Application Number	
Title of Invention	System and Method of Determining the Health and Gender of a Chick	

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	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	a 371 of international	PCT/US2016/061536	2017-11-11

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2016/061536	Claims benefit of provisional	62349981	2016-06-14

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2016/061536	Claims benefit of provisional	62254737	2015-11-11

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

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) 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	Filing Date (YYYY-MM-DD)	Access Code (if applicable)

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

WEB ADS 1.0

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	374-2
	Application Number	
Title of Invention	System and Method of Determining the Health and Gender of a Chick	

☐ 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.

PTO/AIA/14 (08-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	374-2
	Application Number	
Title of Invention	System and Method of Determining the Health and Gender of a Chick	

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.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	374-2
	Application Number	
Title of Invention	System and Method of Determining the Health and Gender of a Chick	

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

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	Applied LifeSciences and Systems, LLC

Mailing Address Information For Applicant:

Address 1	2804 Glen Burnie Drive		
Address 2			
City	Raleigh	**State/Province**	NC
Country[i]	US	Postal Code	27607
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	374-2
	Application Number	
Title of Invention	System and Method of Determining the Health and Gender of a Chick	

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.

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.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

Organization Name	Applied LifeSciences and Systems, LLC

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	2804 Glen Burnie Drive		
Address 2			
City	Raleigh	**State/Province**	NC
Country i	US	Postal Code	27607
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

PTO/AIA/14 (08-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	374-2
	Application Number	
Title of Invention	System and Method of Determining the Health and Gender of a Chick	

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	/Kathleen Lynch/			Date (YYYY-MM-DD)	
First Name	Kathleen	Last Name	Lynch	Registration Number	33957

Additional Signature may be generated within this form by selecting the Add button.

PTO-1390 (01-18)
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TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371

Attorney Docket No.	
374-2	
U.S. Application No. (if known, see 37 CFR 1.5)	

International Application No.	International Filing Date	Priority Date Claimed
PCT/US2016/061536	11/11/2016	11/13/2015

Title of Invention
System and Method of Determining the Health and Gender of a Chick

First Named Inventor
Ramin Karimpour

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). NOTE: The express request under 35 U.S.C. 371(f) will not be effective unless the requirements under 35 U.S.C. 371(c)(1), (2), and (4) for payment of the basic national fee, copy of the International Application and English translation thereof (if required), and the oath or declaration of the inventor(s) have been received.
2. ☒ A copy of the International Application (35 U.S.C. 371(c)(2)) is attached hereto (not required if the International Application was previously communicated by the International Bureau or was filed in the United States Receiving Office (RO/US)).
3. An English language translation of the International Application (35 U.S.C. 371(c)(2))
   a. ☐ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
4. An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4))
   a. ☒ is attached.
   b. ☐ was previously filed in the international phase under PCT Rule 4.17(iv).

Items 5 to 8 below concern amendments made in the international phase.

PCT Article 19 and 34 amendments

5. ☐ Amendments to the claims under PCT Article 19 are attached (not required if communicated by the International Bureau) (35 U.S.C. 371(c)(3)).
6. ☐ English translation of the PCT Article 19 amendment is attached (35 U.S.C. 371(c)(3)).
7. ☐ English translation of annexes (Article 19 and/or 34 amendments only) of the International Preliminary Examination Report is attached (35 U.S.C. 371(c)(5)).

Cancellation of amendments made in the international phase

8a. ☐ Do not enter the amendment made in the international phase under PCT Article 19.

8b. ☐ Do not enter the amendment made in the international phase under PCT Article 34.

NOTE: A proper amendment made in English under Article 19 or 34 will be entered in the U.S. national phase application absent a clear instruction from applicant not to enter the amendment(s).

The following items 9 to 17 concern a document(s) or information included.

9. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
10. ☒ A preliminary amendment.
11. ☒ An Application Data Sheet under 37 CFR 1.76.
12. ☐ A substitute specification. NOTE: A substitute specification cannot include claims. See 37 CFR 1.125(b).
13. ☐ A power of attorney and/or change of address letter.
14. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13*ter*.3 and 37 CFR 1.821-1.825 (not required if sequence listing in text format was indicated on the PCT Request as part of the International Application and the sequence listing was published as part of the international application).
15. ☒ Assignment papers *(cover sheet and document(s))*. Name of Assignee: Applied LifeSciences and Systems, LLC
16. ☐ 37 CFR 3.73(c) Statement *(when there is an Assignee)*.

This collection of information is required by 37 CFR 1.414 and 1.491-1.492. 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 15 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: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

U.S. APPLN. No. (if known – see 37 CFR 1.5)	INTERNATIONAL APPLICATION No.	ATTORNEY DOCKET No.
	PCT/US2016/061536	374-2

17. ☐ Other items or information:

The following fees have been submitted.	CALCULATIONS
18. ■ Basic national fee (37 CFR 1.492(a)) **$300**	$ 300
19. ■ Examination fee (37 CFR 1.492(c)) • If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4)..... **$0** • All other situations **$760**	$ 760
20. ☐ Search fee (37 CFR 1.492(b)) • If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4)..... **$0** • Search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as an International Searching Authority ..... **$140** • International Search Report prepared by an ISA other than the US and provided to the Office or previously communicated to the US by the IB..... **$520** • All other situations **$660**	140 $
TOTAL OF 18, 19, and 20 =	$

☐ Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing in compliance with 37 CFR 1.821(c) or (e) in an electronic medium or computer program listing in an electronic medium) (37 CFR 1.492(j)).

Fee for each additional 50 sheets of paper or fraction thereof **$400**

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof (round **up** to a whole number)	RATE	
- 100 =	/ 50 =		x **$400**	$

Surcharge for furnishing any of the search fee, examination fee, or the oath or declaration after the date of commencement of the national stage (37 CFR 1.492(h)).....**$140**	$

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	- 20 =		x **$100**	$
Independent claims	- 3 =		x **$460**	$
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			**+ $820**	$

Fee for submission of Sequence Listing text file of 300 MB to 800 MB (37 CFR 1.21(o)(1))..... **$1,000**	$
Fee for submission of Sequence Listing text file of more than 800 MB (37 CFR 1.21(o)(2))..... **$10,000**	$
Processing fee for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i))..... **$140** +	$
TOTAL OF ABOVE CALCULATIONS =	$ 1200
■ **Applicant asserts small entity status.** See 37 CFR 1.27. Fees above are reduced by ½.	
☐ **Applicant certifies micro entity status.** See 37 CFR 1.29. Fees above are reduced by ¾. Applicant must attach form PTO/SB/15A or B or equivalent.	
TOTAL NATIONAL FEE =	$ 600
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31)..... **$50.00** per property +	$
TOTAL FEES ENCLOSED =	$ 600

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a. ☐ A check in the amount of $_____ to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $_____ to cover the above fees.

c. ☐ The Director is hereby authorized to charge additional fees which may be required, or credit any overpayment, to Deposit Account No. _____ as follows:

i. ☐ any required fee.

ii. ☐ any required fee except for excess claims fees required under 37 CFR 1.492(d) and (e) and multiple dependent claim fee required under 37 CFR 1.492(f).

d. ■ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038. The PTO-2038 should only be mailed or faxed to the USPTO. However, when paying the basic national fee, the PTO-2038 may NOT be faxed to the USPTO.

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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 1: 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**.

NOTE 2: A U.S. national stage application may not claim priority to the international application of which it is the national phase. The filing date of a U.S. national stage application is the international filing date. See 35 U.S.C. 363.

Correspondence Address

■ The address associated with Customer Number: 90741 **OR** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone			
Email					

Signature	/Kathleen Lynch/	Date	05/11/2018
Name (Print/Type)	Kathleen Lynch	Registration No. (Attorney/Agent)	33,957

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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
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62/254,737 13 November 2015 (13.11.2015) US
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(72) Inventor; and
(71) Applicant : **KARIMPOUR, Ramin** [US/US]; 2804 Glen Burnie Drive, Raleigh, North Carolina 27607 (US).

(74) Agent: **LYNCH, Kathleen M.**; 2500 Regency Parkway, Cary, North Carolina 27518 (US).

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

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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report (Art. 21(3))*

(54) **Title**: SYSTEM AND METHOD OF DETERMINING THE HEALTH & GENDER OF A CHICK

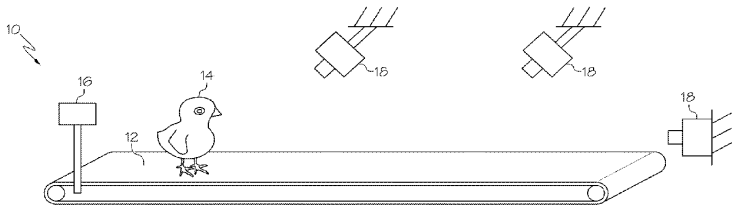


FIG. 1

(57) **Abstract**: A first system for determining the relative health of a chick having a first moving platform to support a chick, a first image capture device, a first database having a library of digital images relating to healthy and unhealthy chicks and a computer processor in communication with the image capture device and database. A second system for determining the gender of a chick includes a second moving platform, a second image capture device, stimuli directed at the chick to cause the chick to open its wings. The second system also includes a second database having wing patterns of male and female chicks of the breed of the chick on the second moving platform and a second computer processor in communication with the second image capture device and the second database.

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SYSTEM AND METHOD OF DETERMINING THE HEALTH & GENDER OF A CHICK

PRIORITY

This application claims priority from U.S. provisional patent application serial no. 62/254737, filed November 13, 2015, and U.S. provisional patent application serial no. 62/349,981 filed June 14, 2016. The contents of each are incorporated herein in their entirety.

FIELD

The embodiments described herein are directed to systems and methods for detecting the relative health and gender of a day old chick. With regard to unhealthy chicks, they are separated from the flock once any illness or injury is detected. With regard to gender determination, once detected, the chicks are separated by gender.

BACKGROUND

There are essentially three types of poultry that are processed in today's mass production environment: broilers, breeders and layers. The broilers are grown and slaughtered at maturity for human consumption. Breeders are raised to breed broilers or layers, and layers are raised to lay eggs for human and animal consumption. In each case, as chicks hatch, they are quickly processed and moved to the next stage of their life. Day old chicks are vulnerable to disease and infection. Due to the crowded conditions in which chicks hatch and live, any chick born with an abnormality or disease may be in a position to infect a multitude of other chicks in the surrounding area. Thus it is critical to the health of the flock to remove any chick having a disease or malformation that could cause illness to other chicks. Moreover, it is only humane to remove any seriously ill chicks or disabled chicks so that they can be humanely euthanized and disposed of before causing further injury to themselves.

Day old broiler chicks are processed quickly in hatcheries and are swiftly transported to "Growth Out Farms" where they will live and grow to desire weight for consumption. There are two common maladies that afflict some chicks. The first is a failure of the abdominal wall to close after absorption of the yolk sac. In such a case, the chick hatches with an open abdominal cavity. This condition is typically terminal. If left undetected for

any length of time, the open wound will attract unwanted bacteria and infection to the area and ultimately the death of the chick.

The second affliction is a malformed or disabled leg or foot or malformed beak or eye. Chicks with malformed legs and feet are unable to withstand the rigors of a mass farming environment, get adequate feed, and water in "Growth Out Farm" and consequently never grow as well as their healthy counterparts. Thus, they need to be removed as quickly as possible.

Thus, there is a need to quickly and efficiently inspect day old chicks to determine whether or not they are sufficiently healthy to withstand the rigors of the poultry production environment. In addition, there is a need to quickly and efficiently detect any physical abnormalities in day old chicks so that those with such abnormalities may be separated from the otherwise healthy flock.

Early gender determination of a chick is also important in poultry production to ensure that the sexes are separated out as soon as possible to ensure efficient investment of appropriate resources. Layer males have no value and similarly a limited number of breeder males are necessary. In the case of the broilers, male broilers are less desirable. The Feed Conversion Ratio (FCR), or cost of feed per weight gained is the main driver for the lack of favorability of broiler males.

Determining the gender of a day old chick has been a common practice in the poultry industry since the early 1900's. Manual vent and feather sexing have been used over the years by the industry to separate male and female chicks. Both methods are considered to be unfriendly to chicks based on the manual handling of the chicks, and increase the seven-day mortality of sexed chicks.

It is known that the gender of a day old chick can be determined by the chick's wing feathers. The feather pattern and length at the bend in the wing vary between male and female day old chicks. However, the present method of manually causing the chick's wings to spread increases the chick's chances for disease and injury. Moreover, the manual methodologies are labor intensive and are likely to cause repetitive injuries to the workers over time.

Thus, there is a need to quickly and automatically inspect day old chicks to determine their sex and subsequently separate them by sex.

SUMMARY

The embodiments described herein include a system having a device for positioning a chick on a moving platform, and an image capturing device to capture at least one electronic image of the chick on the moving platform. The system further includes a database containing electronic images of healthy and unhealthy chicks within the chick's breed, and an image processor in communication with the image capture device and the database. When the captured image of the chick is sent to the image processor, it is compared to the database of chick images and if the image of the chick deviates from the images of healthy chicks in the database or matched with images of unhealthy chicks or presents any anomalies, the chick is separated from the flock.

The positioning device may be a conveyor. The image taken of the chick may be a frontal image. The image taken of the chick may be of its torso. The image taken of the chick may be of its legs, face and feet.

The embodiments herein described further include a method for determining the health of a day old chick including the steps of positioning a chick on a moving platform and capturing at least one electronic image of the chick on the moving platform. The method also includes providing a database containing electronic images of healthy chicks within the chick's breed and providing an image processor in communication with the image capture device and the database. The method further includes comparing the captured image with the electronic images in the database and determining if the captured image deviates from those in the database.

The embodiments described herein further include a system having a device for causing a chick to spread its wings, and an image capturing device to capture at least one electronic image of the chick's wings as they are spread. The system further includes a database containing electronic images of male and female wing patterns within the chick's breed, and an image processor in communication with the image capture device and the database. When the captured image of the chick's wings is sent to the image processor, it is

compared to the database of chick wing patterns for the breed to determine the gender of the chick.

The device for causing a chick to spread its wings is preferably an angled conveyor or hinged platform. The image capture device may be a digital camera. The image taken of the chick may be a front view image.

The embodiments herein also describe a method for determining the gender of a chick including the steps of providing a moving platform to support a chick, introducing at least one stimuli to cause the chick to spread its wings and capturing at least one image of the chick as it spreads its wings. The method further includes providing a database having a library of digital images therein and providing a computer processor in communication with the image capture device and the database. After the chick spreads its wings, an image is taken of the wings. The image of the chick's wing is compared to the library of digital images to determine the gender of the chick.

DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the embodiments will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

Fig. 1 is a perspective view of a portion of the first embodiment;

Fig. 2 is a side schematic view of the first embodiment;

Fig. 3. is an enlarged perspective view of the first angled conveyor of the first embodiment;

Fig. 4 is an enlarged side schematic view of a portion of the first embodiment of Fig. 2;

Fig. 5 is diagrammatic representation of the actuator of the first embodiment in both extended and retracted positions;

Fig. 6 is an enlarged perspective view of the second angled conveyor of the first embodiment;

Fig. 7 is a diagrammatic representation of the communication of various elements of the first embodiment; and

Fig. 8 is a side schematic view of the first embodiment in Fig. 6.

The embodiments herein described are not intended to be limiting. It is intended that the embodiments shall cover all alternatives, modifications, and equivalents as defined herein.

DESCRIPTION

The embodiments herein focus on a system and method for determining the relative health and gender of a chick. The first embodiment 10, shown in Fig. 1 includes a first conveyor 12 that moves the chicks 14 in the hatchery. It should be appreciated that the chicks 14 have been previously separated by other conveyors and dividers and are now travelling along the first conveyor 12 in single file fashion. The first conveyor 12 has a presence sensor 16 to sense the presence of a chick 14 on the first conveyor. One or more cameras 18 are located along the pathway of the first conveyor 12. It is preferred that the cameras 18 be located at the end of the conveyor level with the body of the chick 14 so as to be able to focus on the chick's abdomen, legs and feet. In addition, cameras 18 may be mounted overhead the first conveyor 12 to be able to focus on the chick but not interfere with the chick's travel along the first conveyor. The term conveyor is understood to mean any type of handling mechanism capable of transporting an object, in this case an animal, from a first location to a second location. The term conveyor shall include but not be limited to conveyor belts, moving platforms and the like.

The cameras 18 are preferably video cameras that can take live video footage of each chick 14 as it travels along the first conveyor 12. The cameras 18 are in communication with master system controller 44 and a computer processor 32 (Fig. 7). The computer processor 32 includes a database of images of healthy and unhealthy chicks 14. The computer processor 32 is designed to receive and process the images from the cameras 18 and determine whether or not the chick images show any signs of abnormalities or irregularities that warrant further attention. The details of this process will be discussed below.

As shown in Fig. 2, an angled conveyor 20 is positioned adjacent to and below the first conveyor 12. The first angled conveyor 20 is oriented at an angle θ to the horizon.

The first angled conveyor 20 has a near end 22 and a far end 24. The angled conveyor 20 has a frame 26 to support the angled conveyor (Fig. 4). The frame 26 of the angled conveyor 20 is rotatably connected at the near end 22 to a fixed structure such as the frame structure of the overall system. The frame 26 supports a pair of rails 28 that prevent the chick from falling off of the angled conveyor 20.

An actuator 30, shown in Figs. 3-5, is fixedly connected to the frame 26 of the angled conveyor 20 and also to a support structure such as the frame structure of the overall system. The actuator 30 is positioned normally to support the angled conveyor 20 in an extended position. When activated, the actuator 30 retracts causing the frame 26 of the angled conveyor 20 to pivot about its near end 22 and swing the far end 24 further downward increasing the angle θ. The actuator 30 is in communication with the computer processor 32 that controls the actuator remotely.

Returning to Fig. 2, a third conveyor 34 is located below angled conveyor 20 and is positioned to receive chicks 14 therefrom when the angled conveyor is in its extended position. A fourth conveyor 36 is located further below the angled conveyor 20 and is oriented perpendicularly to the angled conveyor 20, when contracted. The fourth conveyor 36 receives chicks 14 from the angled conveyor 20 when it is retracted by the actuator 30, which will be discussed in more detail below.

A second angled conveyor 38, shown in Fig. 2 and 6, is located immediately below the third conveyor 34 to receive chicks 14 therefrom. A second presence sensor 40 is located at the end of the third conveyor 34. The second presence sensor 40 senses the presence of a chick 14 along the pathway of the second angled conveyor 38.

Cameras 18 are positioned at the end of the third conveyor 34 and at one or more points along the pathway of the second angled conveyor 38 (Fig. 6). The cameras 18 are positioned to focus on the wing pattern of the chicks 14 as they pass.

Fans 42 are located along the pathway of second angled conveyor 38 (Fig. 6). The fans 42 are positioned so as to direct air upwards as the chick 14 passes. Fan activation is controlled by the master control system 44. The master control system is in communication with the computer processor 32 (Fig. 7).

A vibrating mechanism 46, shown in Figs. 6 is fixed to the second angled conveyor 38. During use, the vibrating mechanism 46 causes the second angled conveyor 38 to vibrate. The vibrating mechanism 46 is in communication with the master control system 44. A

strobe light 47 is positioned towards the end and above the pathway of the conveyor 38. The strobe light 47 is also in communication with the master controller 44.

As shown in Fig. 2, a fifth conveyor 48 is located at the end of the second angled conveyor 38. The fifth conveyor 48 receives those chicks 14 coming off of the second angled conveyor 38. A sixth conveyor 50 is positioned directly below and perpendicular to the second angled conveyor 38. The sixth conveyor 50 receives those chicks 14 who are moved off of the second angled conveyor 38 when it is in its retracted positon. This process will be explained in more detail below.

The computer processor 32 includes a database having a library of digital images of the wing patterns of chicks of a variety of chicken breed stored therein. The computer processor 32 (Fig. 7) is also in communication with the second presence sensor 40, cameras 18, and actuator 30 (Fig. 6) via the master control system 44. Moreover, the computer processor 32 is also in communication with a master control system 44 which controls the speed of the conveyors and controls the overall function of operation. The master control system 44 is in electronic communication with the cameras 18, fans 42 and vibrating mechanism 46 (Fig. 6) such that the start and stop of each of the aforementioned may be controlled by the master control system. A diagrammatic representation of the communication between the aforementioned elements is shown in Fig. 7.

In use, after the chicks 14 hatch, they are initially processed and eventually moved onto the first conveyor 12. It should be noted that there may be a series of other conveyors - and dividers and the like (not shown) that may be used to move the newly hatched chick 14 to the conveyor 12. However, such equipment and logistics are not discussed herein.

As the chick 14 travels along the first conveyor 12, first presence sensor 16 detects the presence of a chick travelling along the first conveyor 12 (Fig. 2). The presence sensor 16 communicates with the computer processor 32 which activates the cameras 18 positioned at the end of and above the pathway of the first conveyor 12 and along the angled conveyor 20 (Fig. 3). The cameras 18 takes at least one image of the chick. Preferably the camera 18 is able to take video feed of the chick's abdomen, legs, facial features and feet.

The image or images are electronically communicated to the computer processor 32 (Fig. 7). The computer processor 32 processes the images and compares them with those images in its database of healthy and unhealthy chicks of the same breed. In comparing the camera images with the digital image library, the computer processor 32 is able to detect any abnormalities or deviations in the images taken from standard images in the database. If there is a deviation detected in the image taken, the computer processor 32 registers such a deviation as an abnormality or affliction that needs closer attention.

The computer processor thus communicates its finding with the master control system 44 (Fig. 4), which activates the actuator 30. This causes the near end 22 of the first angled conveyor 20 to pivot and the far end 24 to swing downwardly increasing the angle θ. At a certain angle θ, the chick 14 cannot remain on the first angled conveyor and is dropped onto the fourth conveyor 36 (Fig. 2) for further manual inspection. If the chick is unhealthy, it will be separated from the otherwise healthy flock. If the chick is, in fact, healthy, it will be returned to the flock for further processing.

Once the chick has been transferred to the fourth conveyor 36, the actuator 30 (Fig. 5) is reversed and causes the first angled conveyor 20 to return to its extended position. This results in the far end 24 of the first angled conveyor 20 swinging upwardly as the near end 22 pivots about itself and the angle θ declines. Once the actuator has returned the first angled conveyor 20 to its original position, it is ready to receive another chick 14. In this manner, only healthy chicks are permitted to advance to the third conveyor 34.

Once a healthy chick has progressed to the third conveyor 34, the second presence sensor 40 (Fig. 6) detects its presence on the third conveyor 34. The second presence sensor 40 communicates with the computer processor 32 and master control system 44 (Fig. 7) to activate the cameras 18, fans 42, strobe light 47 and vibrating mechanism 46 adjacent to the second angled conveyor 38.

At the end of travel along the third conveyor 34, the chick moves onto the second angled conveyor 38. At this time, the chick encounters the second angled conveyor 38 with air blowing upwardly from its feet towards its face and head created by the fans 42. In addition, the surface of the second angled conveyor 38 is vibrating as a result of the

activation of the vibrating mechanism 46. The upwardly blowing air and vibrating surface cause the chick to feel unbalanced. In an effort to regain its balance, the chick begins to lift and flap its wings. As it does the cameras 18 take images of the opened wing pattern. The flashing of the strobe light 47 is also expected to have a similar stimuli effect on the chick.

The images are communicated with the computer processor 32 (Fig. 7) which processes the images and compares them to images of male and female wing patterns within its database for chicks of that breed. In comparing the images, the computer can determine the gender of the chick at issue. If the computer processor 32 determines the chick to be a female, the chick is allowed to proceed to the fifth conveyor 48 where it is crated and transferred to a growing farm. If the chick is determined to be a male, the computer processor 32 activates the actuator 30 which retracts and causes the second angled conveyor 38 to pivot and the far end 20 to swing downwardly increasing the angle θ. At a certain angle θ, the chick 14 cannot remain thereon and is dropped onto an alternate conveyor 50 for further processing. Chicks will be separated by sex and processed separately.

Once the male chick 14 has been transferred to an alternate platform, the master control system 44 deactivates the actuator 30 (Fig. 6). This causes the second angled conveyor 38 to return to its extended position. This results in the far end 20 of the second angled conveyor 38 swinging upwardly as the near end 18 pivots about itself and the angle θ declines. Once the actuator 30 has returned the second angled conveyor 38 to its original position, it is ready to receive another chick.

Thus it is apparent that the embodiments herein provided fully satisfy the objects, aims and advantages set forth above. It is evident that many alternatives, modifications and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly it is intended to embrace all such alternatives, modifications, and variations as fall within the spirit and scope of the appended claims.

CLAIMS

What is claimed is:

1. A system for determining the sex of a chick comprising:

a moving platform to support a chick;

at least one stimuli to cause the chick to open its wings;

an image capture device to capture at least one image of the chick;

a database having a library of digital images; and

a computer processor in communication with the image capture device and the database, whereby the image of the chick is compared to the library of digital images to determine the sex of the chick.

2. The system of claim 1 further comprising a master control system in communication with the camera, moving platform, database, computer processor and moving platform.

3. The system of claim 1 wherein the stimulus is an angled conveyor belt.

4. The system of claim 1 wherein the stimulus is a vibrating conveyor belt.

5. The system of claim 1 wherein the stimulus is a strobe light.

6. The system of claim 1 wherein the stimulus is a stream of air blowing on the chick.

7. The system of claim 1 wherein the library of digital images is particular to the chick's breed.

8. The system of claim 5 wherein the digital images are wing patterns.

9. A system for determining the health of a day old chick comprising:

a moving platform upon which a chick is positioned;

image capturing device to capture at least one electronic image of the chick on the moving platform;

a database containing electronic images of healthy and unhealthy chicks within the chick's breed;

computerized image processor in communication with the image capture device and the database, whereby the captured image of the chick is sent to the computerize image processor where it is compared to the database and if the image of the chick deviates from the images in the database, the moving chick is separated out from the flock.

10. The system of claim 9 wherein the image is that of the feet, face and legs.

11. The system of claim 9 wherein the image captured is that of the abdomen.

12. The system of claim 1 further comprising a device for altering the platform's position.

13. A system for determining the health and gender of a day old chick comprising:

a first moving platform upon which a chick is positioned;

first image capturing device to capture at least one digital image of the chick on the first moving platform;

a first database containing digital images of healthy and unhealthy chicks within the chick's breed;

second moving platform;

at least one stimuli applied to the second moving platform;

second image capture device to capture a second digital image of the chick on the second moving platform;

second database containing digital images of wing patterns for each gender of chick;

computerized image processor in communication with the first and second image capture devices, and first and second databases,

whereby the captured first image of the chick is processed by the computerize image processor where it is compared to the first database and healthy chicks are separated from any unhealthy chicks, and the healthy chicks move to the second moving platform where the captured second image of the healthy chick is processed by the computerize image processor where it is compared to the second database to determine the gender of the chick and the chicks are separate by gender.

14. The system of claim 13 wherein the chicks are separated by a position altering device.

15. The system of claim 14 wherein the position altering device comprises an angled conveyor actuated to pivot about one end so that the chick on the angled conveyor can no longer remain thereon and drops to a different surface.

16. The system of claim 13 wherein the stimuli include but are not limited to forced air, strobe lighting, and vibration applied to the second moving platform.

17. The system of claim 13 wherein the first image capture device captures images of the chick's abdomen, legs or feet.

18. The system of claim 13 wherein the chick is less than one day old.

19. The system of claim 13 wherein the first or second moving platform is angled.

20. The system of claim 13 wherein the digital images captured by the second image capture device are the chick's wings.

5

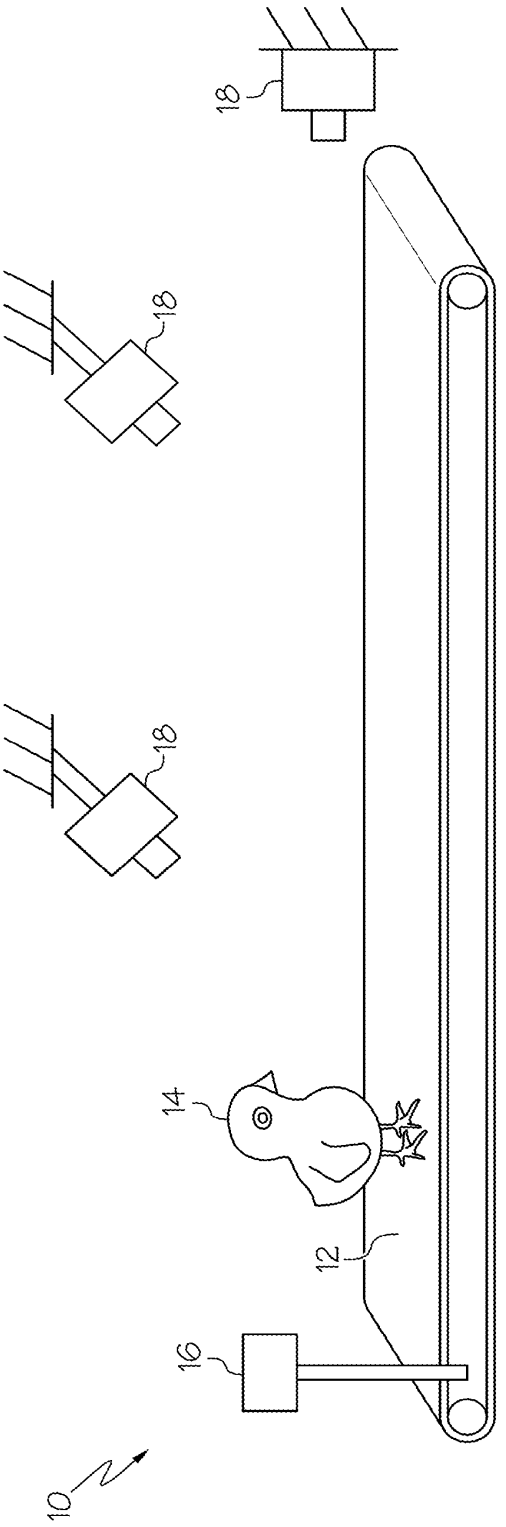


FIG. 1

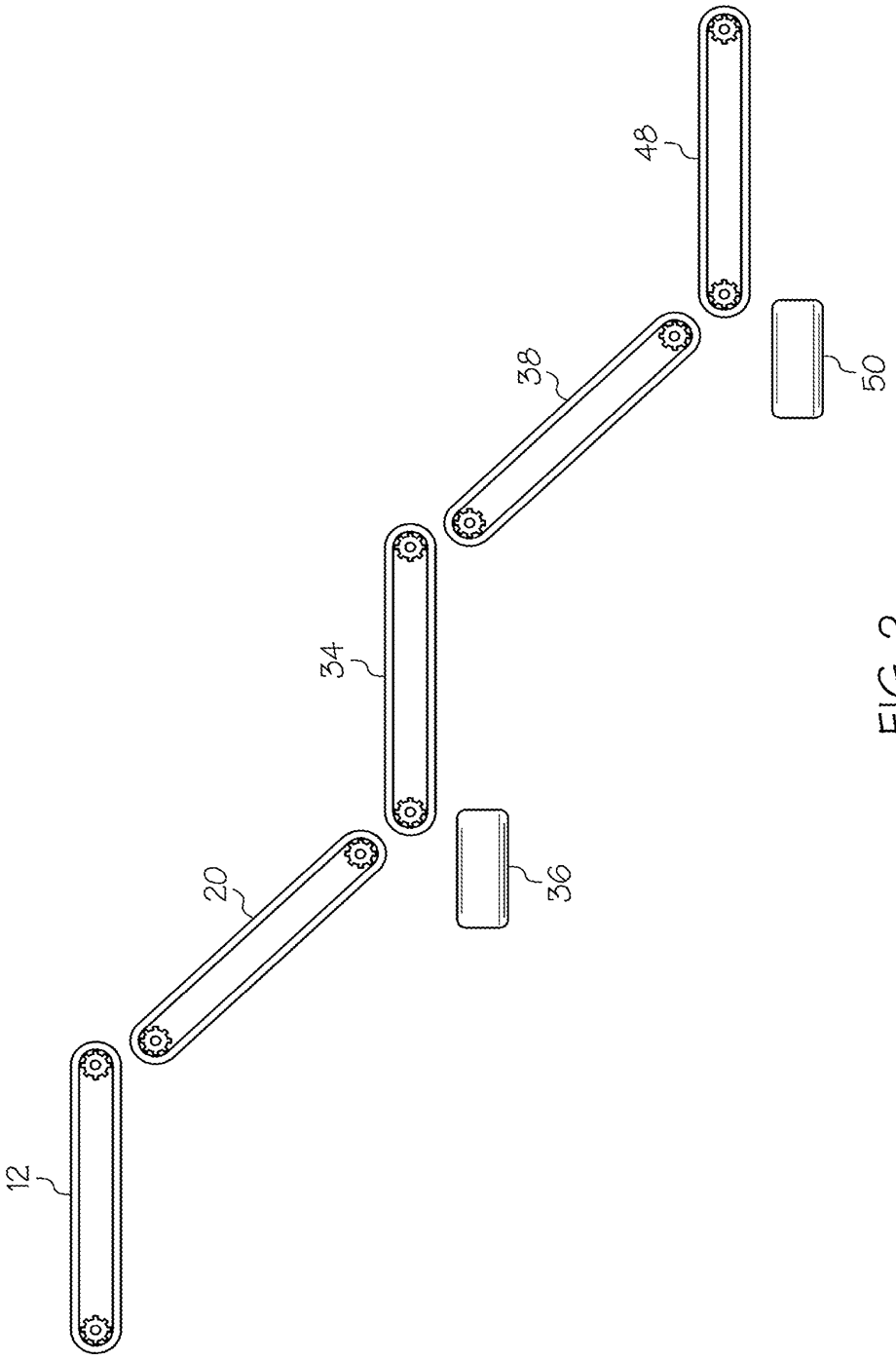


FIG. 2

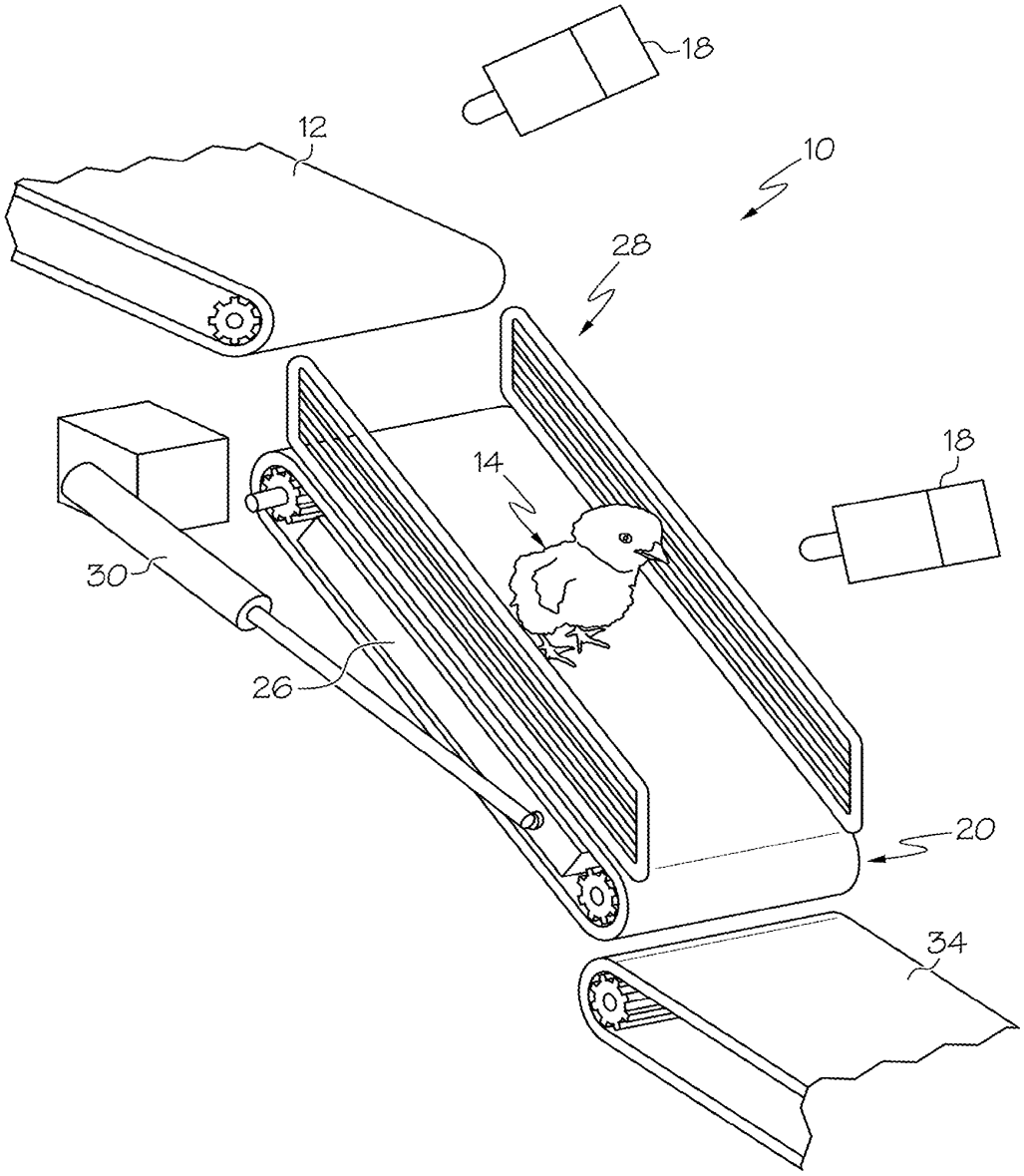


FIG. 3

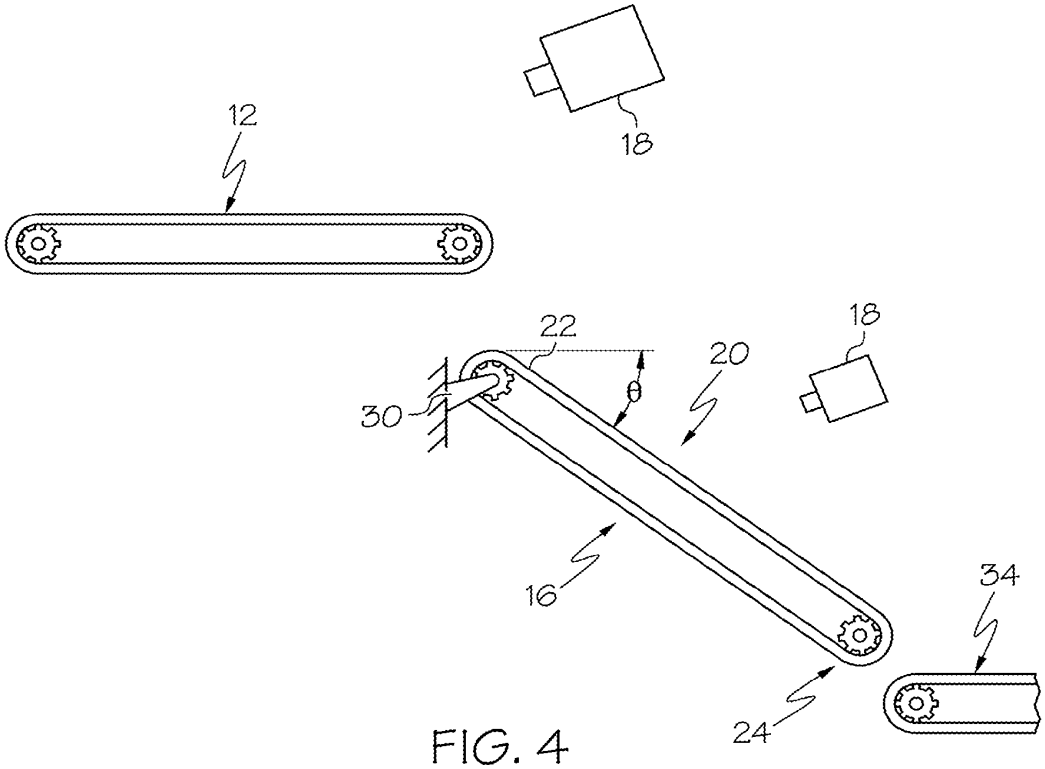


FIG. 4

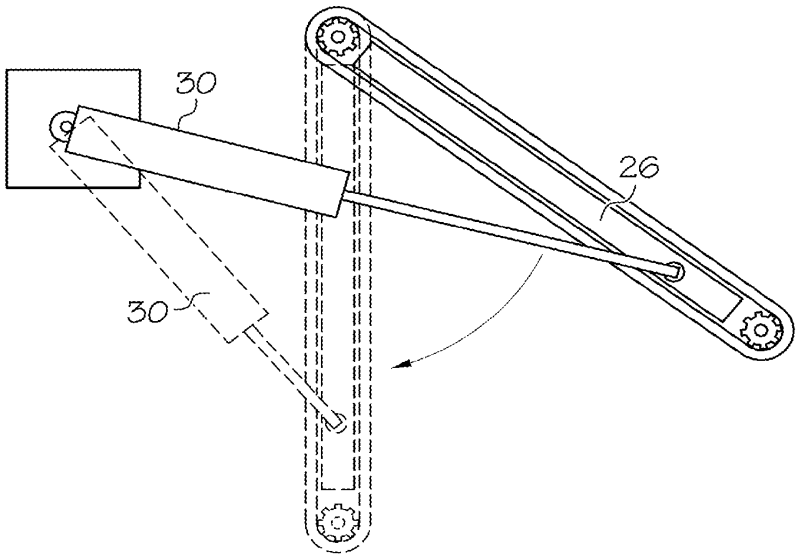


FIG. 5

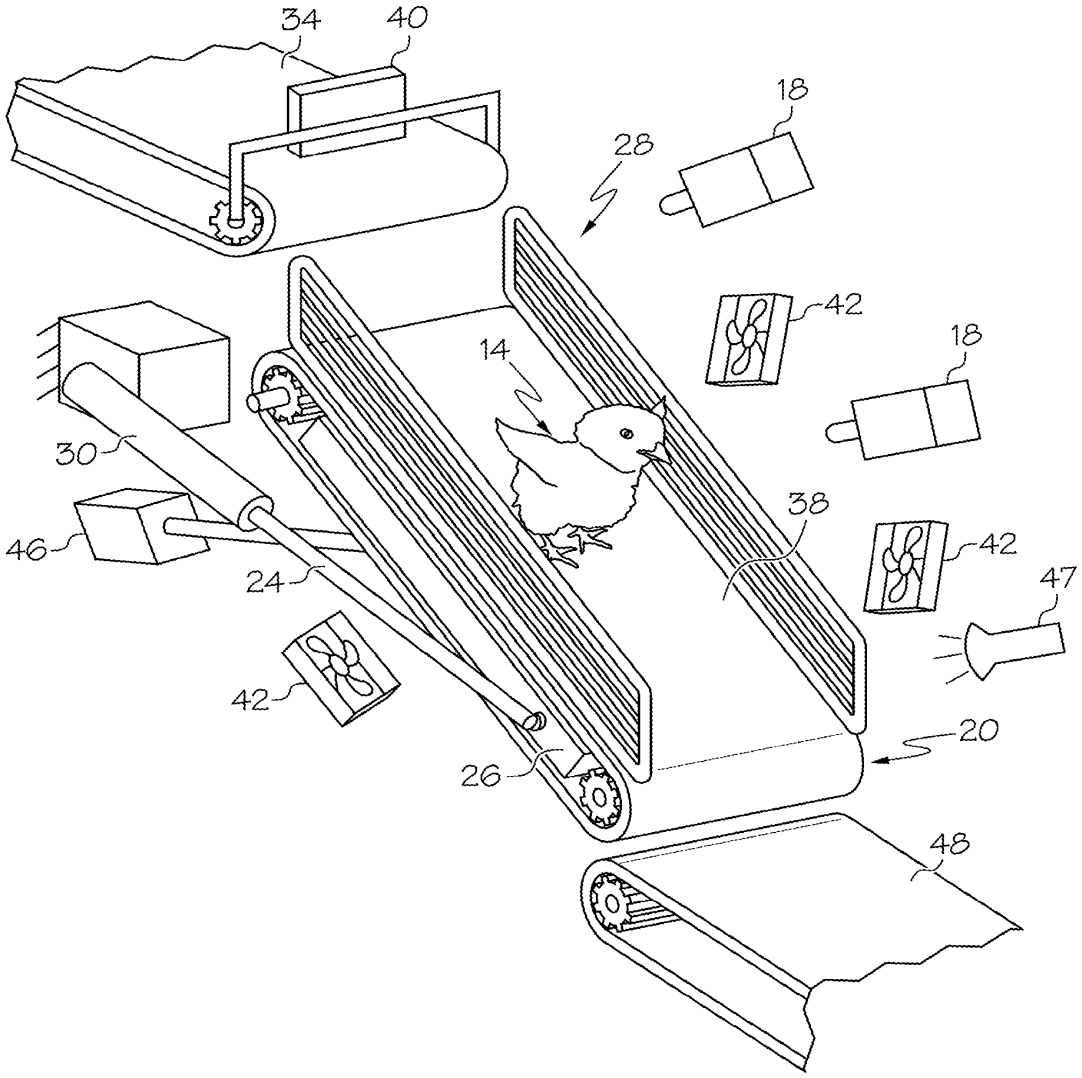


FIG. 6

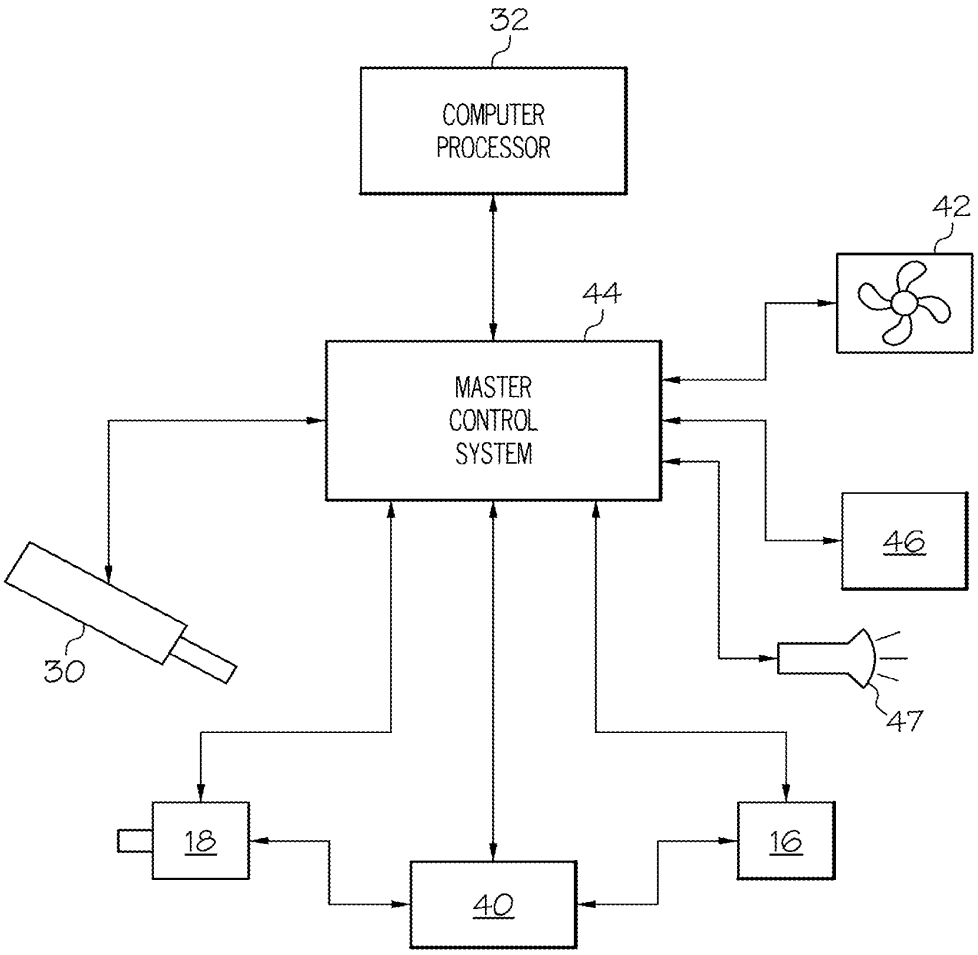

32
COMPUTER PROCESSOR
42
44
MASTER CONTROL SYSTEM
46
30
47
18
16
40

FIG. 7

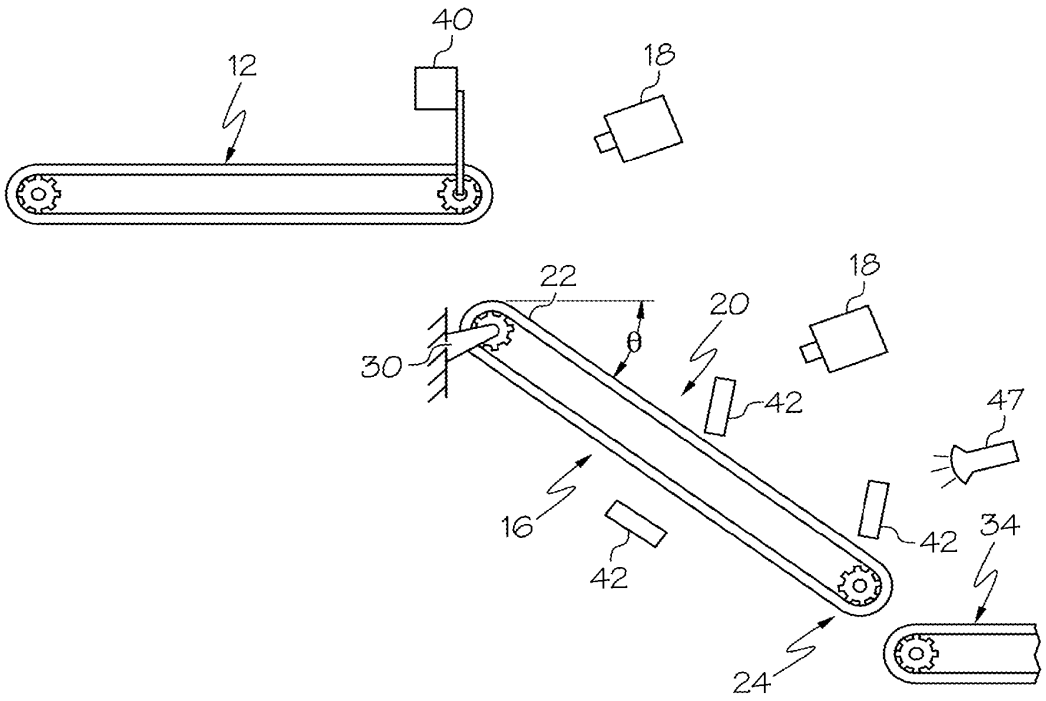


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US16/61536

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A01K45/00, A01K29/00, A61B5/00, B07C5/34, G06F19/00 (2017.01)
CPC - A01K45/00, A01K29/005, A61B5/0077, A61B2503/40, B07C5/34, G06F19/3443
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) Classifications: A01K45/00, A01K29/00, A61B5/00, B07C5/34, G06F19/00 (2017.01)
CPC Classifications: A01K45/00, A01K29/005, A61B5/0077, A61B2503/40, B07C5/34, G06F19/3443

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatSeer (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, INPADOC Data); Google Scholar, Pubmed, EBSCO
Chick, hatchling, fledgling, sexing, female, male, determine, sense, detect, ascertain, wing, limb, open, wide, unfurl, spread, image, camera, photograph, database, library, bird, avian, computer, compare, day, old, health, disease, condition, illness, balance, destabilize

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GERSHMAN, Y. A simple way to determine the sex of one-day poultry chickens (basic principles). The Papers of Independent Authors [online]. Volume 28. DNA, 2014 [retrieved on 2017-01-03]. Retrieved from the Internet: <URL: http://vixra.org/abs/1405.0016>, pages 5-16, ISBN 978-1-312-23676-9; page 4 points 12-14, page 5 paragraph 1, page 6 paragraph 1	1, 7, 12
Y		2-6, 8
Y	US 2005/0098121 A1 (GORANS, MS) May 12, 2005; paragraphs [0003], [0014], [0016], [0038], [0082]-[0083]	2
A		9-11, 13-20
Y	EP 2579188 A1 (WEEKERS, R) October 4, 2013; paragraphs [0013], [0017], [0019], [0022], [0027]-[0028]	3, 6
A		9-11, 13-20
Y	US 2001/0035370 A1 (YAVNAI, A, et al.) November 1, 2001; paragraph [0014]	4
Y	GUY, TM, et al. Development of Epileptic Activity in Embryos and Newly Hatched Chicks of the Fayoumi Mutant Chicken. Epilepsia. Vol. 36, No. 1, January 1995 [online], [retrieved on 2017-01-03]. Retrieved from Internet: <URL: http://onlinelibrary.wiley.com/doi/10.1111/j.1528-1157.1995.tb01673.x/abstract>; pages 102-103, 105	5, 8
A	US 2015/0289478 A1 (ANIMAL BIOTECH LLC); October 15, 2015; paragraphs [0059], [0071], [0083]-[0084], [0217], [0228]	9-11, 13-20
A	WO 2014/118788 A2 (FAUNUS LTD.) August 7, 2014; page 11 lines 16-21, page 44 lines 26-32, page 59 lines 5-6, 23-26	9-11, 13-20

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
09 January 2017 (09.01.2017)	03 FEB 2017
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer Shane Thomas PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US16/61536

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2009/0000915 A1 (NADREAU, M, et al.) January 1, 2009; entire document	1-20
A	US 6,396,938 B1 (TAO, Y, et al.) May 28, 2002; entire document	1-20
A	US 2014/0069336 A1 (MCKAY, JC) March 13, 2014; entire document	1-20
A	US 2014/0155756 A1 (FAUNUS LTD.) June 5, 2014; entire document	1-20

Form PCT/ISA/210 (continuation of second sheet) (January 2015)

ASSIGNMENT OF PATENT APPLICATIONS

Whereas I, Ramin Karimpour, residing at 3012 Cypress Knee Court, Raleigh, NC 27607, the undersigned inventor have invented certain new and useful improvements as set forth in the patent applications below.

Filing Date	Serial No.	Title
Nov. 13, 2015	62/254,737	Automated High-throughput Targeted Vaccine/Medication Delivery Systems to Recently Hatched Poultry Chicks, And Associated Methods
June 14, 2016	62/349,981	System and Method of Determining the Health of a Day Old Chick
Nov. 11, 2016	PCT/US16/61548	Automatic System and Method of Delivering a Substance to an Animal
Nov. 11, 2016	PCT/US16/61536	System and Method of Determining the Health and Gender of a Chick
Nov. 11, 2016	PCT/US16/61565	Automatic System and Method of Injecting a Substance into an Animal

For good and valuable consideration and in compliance with the terms of the Founders Agreement between the parties herein dated March 20, 2017, the receipt and sufficiency of which is hereby acknowledged, I the undersigned sole inventor hereby:

1. Sell, assign and transfer to Applied LifeSciences and Systems, LLC having a business address at 2804 Glen Burnie Drive, Raleigh, NC 27607 (hereinafter referred to as "Assignee"), the entire right, title, and interest in and to any and all improvements and inventions disclosed in, domestic and foreign applications based upon, and Patent(s) (including foreign patents) granted upon the information disclosed in the above-referenced applications.

2. Authorize and request the Commissioner of Patents, and any other governmental agency in any jurisdiction in which patent protection is sought, to issue any and all Letters Patent resulting from said applications or any divisional, continuation, continuation-in-part, substitute, or reissue thereof to the Assignee.

3. Agree to execute all papers and documents and entirely at Assignee's expense, perform acts which are reasonably necessary in the prosecution of said applications, both foreign and domestic, based thereon, and/or the enforcement of patents resulting from said applications.

4. Agree that the terms, covenants and conditions of this Assignment shall inure to the benefit of Assignee, its successors, assigns and other legal representatives, and shall be binding upon the inventor, as well as the inventor's heirs, legal representatives and assigns.

5. Warrant and represent that I have not entered, and will not enter, into any assignment, contract or understanding that conflicts with the terms of this assignment.

Signed: _____ Date: 3, 20, 2018

Ramin Karimpour

State of North Carolina

Wake County

On this 20, day of March, 2018 before me, Wesley Hayden, Notary Public, personally appeared Ramin Karimpour personally known to me (or proved to me on the basis of satisfactory evidence) to be the person whose name is subscribed within this instrument and acknowledged to me that he executed the same in his authorized capacity and that by his signature on this instrument the person or entity upon behalf of which the person acted, executed the instrument.

WITNESS my hand and official seal.

Notary Signature: _____

exp: 20 July 2019

WESLEY HAYDEN NOTARY PUBLIC WAKE COUNTY, NC

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
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 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	SYSTEM AND METHOD OF DETERMINING THE HEALTH & GENDER OF A CHICK

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] 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: Ramin Karimpour Date (Optional): May 10, 2018

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.

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92*bis*.1 and Administrative Instructions, Section 422)

To:

LYNCH, Kathleen M.
2500 Regency Parkway
Cary, North Carolina 27518
ÉTATS-UNIS D'AMÉRIQUE

Date of mailing *(day/month/year)*
14 May 2018 (14.05.2018)

Applicant's or agent's file reference
ALS-S-CHICK

IMPORTANT NOTIFICATION

International application No.
PCT/US2016/061536

International filing date *(day/month/year)*
11 November 2016 (11.11.2016)

1. The following indications appeared on record concerning:

☒ the applicant ☒ the inventor ☐ the agent ☐ the common representative

Name and Address
KARIMPOUR, Ramin
2804 Glen Burnie Drive
Raleigh, North Carolina 27607

State of Nationality | State of Residence

Telephone No.

Facsimile No.

E-mail address

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒ the person ☐ the name ☐ the address ☐ the nationality ☐ the residence

Name and Address
APPLIED LIFESCIENCES AND SYSTEMS, LLC
2804 Glen Burnie Drive
Raleigh, NC 27607
United States of America

State of Nationality: US | State of Residence: US

Telephone No.

Facsimile No.

E-mail address
☐ Notifications by e-mail authorized

3. Further observations, if necessary:
The person identified in Box 2 has been added as applicant for all designated States. The person identified in Box 1 is now inventor only.

4. A copy of this notification has been sent to:

☒ the receiving Office
☐ the International Searching Authority
☐ the Authority(ies) specified for supplementary search
☐ the International Preliminary Examining Authority
☒ the designated Offices concerned
☐ the elected Offices concerned
☐ other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 89 70

Authorized officer
Dezempte Anne
e-mail pct.team6@wipo.int
Telephone No. +41 22 338 74 06

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference ALS-S-CHICK	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2016/061536	International filing date *(day/month/year)* 11 November 2016 (11.11.2016)	Priority date *(day/month/year)* 13 November 2015 (13.11.2015)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant APPLIED LIFESCIENCES AND SYSTEMS, LLC		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☒	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 15 May 2018 (15.05.2018)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Agnès Wittmann-Regis e-mail: pct.team6@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: Kathleen M. Lynch
2500 Regency Parkway
Cary, North Carolina 27518
United States of America

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	03 FEB 2017
Applicant's or agent's file reference: ALS-S-CHICK	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US16/61536	11 November 2016 (11.11.2016)	13 November 2015 (13.11.2015)

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - A01K45/00, A01K29/00, A61B5/00, B07C5/34, G06F19/00 (2017.01)
CPC - A01K45/00, A01K29/005, A61B5/0077, A61B2503/40, B07C5/34, G06F19/3443

Applicant: Ramin Karimpour

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

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

2. **FURTHER ACTION**

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

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

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

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	09 January 2017 (09.01.2017)	Shane Thomas PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (January 2015)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US16/61536

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a)).

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

   a. ☐ forming part of the international application as filed:

      ☐ in the form of an Annex C/ST.25 text file.

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US16/61536

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

1. Statement

Novelty (N)	Claims	2-6, 8-11, 13-20	YES
	Claims	1, 7, 12	NO
Inventive step (IS)	Claims	9-11, 13-20	YES
	Claims	1-8, 12	NO
Industrial applicability (IA)	Claims	1-20	YES
	Claims	NONE	NO

2. Citations and explanations:

Claims 1, 7, 12 lack novelty under PCT Article 33(2) as being anticipated by "A simple way to determine the sex of one-day poultry chickens (basic principles)" to Gershman.

As per claim 1, Gershman discloses a system for determining the sex of a chick comprising (computerized optical separator for determining the sex of one-day chickens; page 1, abstract, paragraph 1): a moving platform to support a chick (chickens are placed on a moving plate; page 3, 1 stage, paragraph 2); at least one stimuli to cause the chick to open its wings (mechanical activator which results in a sharp fall causing chicks to reflexively open their wings; page 5 last paragraph, page 6 paragraph 1); an image capture device to capture at least one image of the chick (take pictures of chicks with open wings using digital camera with white backlight; page 3, prerequisites solutions, point 1); a database having a library of digital images (learning algorithm based on 40 images of chickens, to obtain polygons limiting area of males and females; page 3, prerequisites solutions, last paragraph, page 3, 1 stage, paragraph 1, page 4 point 14); and a computer processor in communication with the image capture device and the database (polygons representative of males and females stored in memory of computer, segmentation and regions of interest determined; page 4 points 10-14), whereby the image of the chick is compared to the library of digital images to determine the sex of the chick (second stage is automatic sorting of the chickens by comparing compactness and roughness of wings derived from images to polygons obtained from learning stage to decide if female or male; page 4 point 14, page 4, 2 stage, paragraph 1).

As per claim 7, Gershman discloses the system of claim 1, and Gershman further discloses wherein the library of digital images is particular to the chick's breed (200 one-day chickens, breed Ross processed, via learning algorithm to obtain polygons limiting area of males and females; page 4 point 14, page 5 paragraph 1).

As per claim 12, Gershman discloses the system of claim 1, and Gershman further discloses further comprising a device for altering the platform's position (to ensure sharp fall of plate, mechanical activator, a cylinder with flexible wheel at the end of the pusher, provides the initial acceleration; page 5 last paragraph).

Claim 2 lacks an inventive step under PCT Article 33(3) as being obvious over Gershman in view of US 2005/0098121 A1 to Gorans

As per claim 2, Gershman discloses the system of claim 1, but Gershman does not disclose further comprising a master control system in communication with the camera, database, computer processor, and moving platform. However, Gorans discloses further comprising a master control system in communication with the camera, database, computer processor, and moving platform (control system operatively connected to the automated conveying system and the plurality of processing stations, contains network for communications, including to imaging station and database; paragraphs [0016], [0038], [0052], [0083]). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Gershman to include further comprising a master control system in communication with the camera, database, computer processor, and moving platform, at taught by Gorans, for the advantage of providing flexibility in how each hatchling can be processed, as well as optimizing processing of each hatchling based on the characteristics of that hatchling (see Gorans, paragraph [0055]).

Claims 3, 6 lack an inventive step under PCT Article 33(3) as being obvious over Gershman in view of EP 2579188 A1 to Weekers.

As per claim 3, Gershman discloses the system of claim 1, but Gershman does not disclose wherein the stimulus is an angled conveyor belt. However, Weekers disclose wherein the stimulus is an angled conveyor belt (unbalancing chicks to cause chicks to spread wings by falling down outer edge of upper conveyer, upper run contains angled guiding plate; paragraphs [0019], [0027]). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Gershman to include wherein the stimulus is an angled conveyor belt, at taught by Weekers, for the advantage of increasing the likelihood of the chicks opening their wings, while also maintaining their safety.

As per claim 6, Gershman discloses the system of claim 1, but Gershman does not disclose wherein the stimulus is a stream of air blowing on the chick. However, Weekers discloses wherein the stimulus is a stream of air blowing on the chick (air blowers direct the chicks during their fall, causing wing opening; paragraphs [0019], [0022]). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Gershman to include wherein the stimulus is a stream of air blowing on the chick, at taught by Weekers, for the advantage of increasing the likelihood of the chicks opening their wings, while also maintaining their safety.

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

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US16/61536

Box No. VII Certain defects in the international application

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

Claim 2 is objected to under PCT Rule 66.2(a)(iii) as containing the following defect(s) in the form or contents thereof: Claim 2 is missing a comma after "computer processor." Claim 2 also repeats the phrase "moving platform" as part of the list "the camera, moving platform, database, computer processor and moving platform", and for the purposes of this opinion, will be interpreted as "the camera, database, computer processor, and moving platform."

Claims 9 and 13 are objected to under PCT Rule 66.2(a)(iii) as containing the following defect in the form or contents thereof: In claims 9 and 13, the word "computerize" is interpreted as being a typographical error, and for the purposes of this opinion, will be interpreted as the word "computerized".

Claim 10 is objected to under PCT Rule 66.2(a)(iii) as containing the following defect(s) in the form or contents thereof: Claim 10 is missing a comma after "face."

Claim 17 is objected to under PCT Rule 66.2(a)(iii) as containing the following defect(s) in the form or contents thereof: Claim 17 is missing a comma after "legs."

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US16/61536

Box No. VIII Certain observations on the international application

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

Claim 10 is objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because claim 10 is indefinite for the following reason(s): Claim 10 refers to "the feet, face and legs" and there is a lack of antecedent basis for these limitations in the claim. For the purpose of this opinion, as best understood, the claim is interpreted to read "...wherein the image captured is that of feet, face, and legs."

Claim 11 is objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because claim 11 is indefinite for the following reason(s): Claim 11 refers to "the abdomen" and there is a lack of antecedent basis for these limitations in the claim. For the purpose of this opinion, as best understood, the claim is interpreted to read "...wherein the image captured is that of an abdomen."

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US16/61536

Supplemental Box

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

-***-Continued from Box V: Citations and Explanations-***-
Claim 4 lacks an inventive step under PCT Article 33(3) as being obvious over Gershman in view of US 2001/0035370 A1 to Yavnai et al. (hereinafter Yavnai).

As per claim 4, Gershman discloses the system of claim 1, but Gershman does not disclose wherein the stimulus is a vibrating conveyor belt. However, Yavnai discloses wherein the stimulus is a vibrating conveyor belt (apparatus used to cause a chick to lose equilibrium includes a mechanical vibrator for vibrating a surface of the conveyer belt; paragraph [0014]). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Gershman to include wherein the stimulus is a vibrating conveyor belt, at taught by Yavnai, for the advantage of increasing the likelihood of the chicks opening their wings, while also maintaining their safety.

Claims 5, 8 lack an inventive step under PCT Article 33(3) as being obvious over Gershman in view of "Development of Epileptic Activity in Embryos and Newly Hatched Chicks of the Fayoumi Mutant Chicken" to Guy et al. (hereinafter Guy)

As per claim 5, Gershman discloses the system of claim 1, but Gershman does not disclose wherein the stimulus is a strobe light. However, Guy discloses wherein the stimulus is a strobe light (extension of both wings as a result of light, chicks administered single flashes or intermittent light stimulation; page 102 paragraph 6, page 103 paragraph 1, page 105 paragraph 4). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Gershman to include wherein the stimulus is a strobe light, at taught by Guy, for the advantage of increasing the likelihood of the chicks opening their wings, while also testing the chicks for possible mutations.

As per claim 8, Gershman and Guy, in combination, disclose the system of claim 5, and Gershman discloses wherein the digital images are wing patterns (images of compactness and roughness of wings to draw polygons of contour of wings; page 4 points 12-14).

Claims 9, 13 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest a system for determining the health of a day old chick comprising: a moving platform upon which a chick is positioned; image capturing device to capture at least one electronic image of the chick on the moving platform; a database containing electronic images of healthy and unhealthy chicks within the chick's breed; computerized image processor in communication with the image capture device and the database, whereby the captured image of the chick is sent to the computerized image processor where it is compared to the database and if the image of the chick deviates from the images in the database, the moving chick is separated out from the flock.

Weekers discloses a system for determining the health of chick comprising (apparatus for analyzing, selecting, counting, and boxing chicks, with data processing unit to determine leg length, beak and heal quality, indicative of health; paragraphs [0001], [0013], [0017]): a moving platform upon which a chick is positioned (chicks are supplied by the conveyor towards the upper run; paragraph [0028]); image capturing device to capture at least one electronic image of the chick on the moving platform (camera directed to end of conveyer, camera outputs at least 20 images per second; paragraphs [0007], [0028]); computerized image processor in communication with the image capture device (data processing unit comparing shape of individualized chicks on subsequent images; paragraph [0019]), if the image of the chick deviates, the moving chick is separated out from the flock (data processing unit communicates with a chicken sorter, where chicks with deviant beaks or heels or without a proper reflex are boxed into different containers; paragraph [0020]); but Weekers does not disclose that the chick is a day old, nor does Weekers disclose a database containing electronic images of healthy and unhealthy chicks within the chick's breed; computerized image processor in communication the database, whereby the captured image of the chick is sent to the computerized image processor where it is compared to the database and if the image of the chick deviates from the images in the database, the moving chick is separated out from the flock.

Gorans discloses a system for determining the health of a day old chick comprising (system for processing hatchlings at a plurality of stations, including station for determining physical traits or abnormalities; paragraphs [0003], [0082]): a moving platform upon which a chick is positioned (automated conveying system connecting processing stations with hatchling carrier; paragraphs [0014]); image capturing device to capture at least one electronic image of the chick on the moving platform (imaging station to form images of hatchlings in combination with conveyer with hatchling carrier for facilitating processing; paragraphs [0014], [0067], [0082]); a database (information regarding hatchling is stored in database; paragraph [0013]); computerized image processor in communication with the image capture device (imaging station with image processing to determine characteristic of hatchling based on images; paragraph [0082]), and if the image of the chick deviates, the moving chick is separated out from the flock (segregate hatchlings at unloading station based on physical characteristics determined via the processor; paragraph [0094]); but Gorans does not disclose a database containing electronic images of healthy and unhealthy chicks within the chick's breed; computerized image processor in communication the database, whereby the captured image of the chick is sent to the computerized image processor where it is compared to the database and if the image of the chick deviates from the images in the database, the moving chick is separated out from the flock.

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

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US16/61536

Supplemental Box

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

-***-Continued from Previous Supplemental Box-***-
US 2015/0289478 A1 to Animal Biotech LLC discloses a system for determining the health of a chick comprising (system to identify animals and characterize health, including of chickens; paragraphs [0217], [0228]): image capturing device to capture at least one electronic image of the chick (digital images of individual animals are capture by cameras; paragraph [0060]); a database containing electronic images (livestock image database; paragraph [0071]); computerized image processor in communication with the image capture device and the database (image processing computer to transform livestock images and matched to database; paragraph [0059]), whereby the captured image of the chick is sent to the computerized image processor where it is compared to the database (digital images are captured by cameras, animal image data communicated over network to image processing computer to match to livestock database; paragraphs [0059], [0071]); and if the image of the chick deviates from the images in the database, the moving chick is separated out from the flock (animal image data processed by image recognition process to determine health via database, if livestock potentially ill, livestock can be removed; paragraphs [0083]-[0084]); but Animal Biotech LLC does not disclose that the chick is a day old and that the image capturing device captures that image on the moving platform, nor does Animal Biotech LLC disclose a moving platform upon which a chick is positioned; and a database containing electronic images of healthy and unhealthy chicks within the chick's breed.

WO 2014/118788 A2 to Faunus Ltd. discloses a system for determining the health of a chick comprising (system is used to monitor the health of the population of a livestock, including chickens; page 11 lines 16-21): image capturing device to capture at least one electronic image of the chick (optical detectors directly observe signs of health and disease, including visual cameras for chickens; page 44 lines 26-32); a database containing electronic images (historical database of tracked sets of livestock with marker, marker detected by camera; page 59 lines 5-6, 23-26); computerized image processor in communication with the image capture device (optical sensor, a camera, in communication with a processor; page 45 lines 20-22, 28), whereby the captured image of the chick is sent to the computerized image processor where it is compared to the database (comparisons made to historical populations and behavior over time, changes compared to previous poultry houses, images captured are analyzed; page 49 lines 18-22, 26-28); but Faunus Ltd. does not disclose that the chick is a day old (twenty four day old chicken; page 86, lines 28-29) and that the image capturing device captures that image on the moving platform; nor does Faunus Ltd. disclose a moving platform upon which a chick is positioned; and a database containing electronic images of healthy and unhealthy chicks within the chick's breed; and that the image capturing device captures that image on the moving platform.

As the prior art does not disclose or reasonably suggest a system for determining the health of a day old chick using a database containing electronic images of healthy and unhealthy chicks within the chick's breed, claims 9 and 13 meet the criteria set out in PCT Article 33 (2)-(3).

Claims 10-11 meet the criteria set out in PCT Article 33(2)-(3), because they are dependent on Claim 9.

Claims 14-20 meet the criteria set out in PCT Article 33(2)-(3), because they are dependent on Claim 13.

Claims 1-20 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.