

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SMAXTEC INC. and
SMAXTEC ANIMAL CARE GMBH,
Petitioners,

v.

ST REPRODUCTIVE TECHNOLOGIES, LLC,
Patent Owner.

Case No. IPR2024-00875
U.S. Patent No. 9,844,206

REPLY DECLARATION OF TAMI M. BROWN-BRANDL, Ph.D.

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I. INTRODUCTION

1. I submit this Reply Declaration in connection with the *Inter Partes* Review (“IPR”) of claims 1-4, 6, and 17-20 (“challenged claims”) of U.S. Patent No. 9,844,206 (“the ’206 patent”). I previously provided a declaration, dated May 1, 2024 (my “Opening Declaration”), and I incorporate by reference the contents of my Opening Declaration in their entirety. I provide this Reply Declaration in further support of this IPR.

2. I am being compensated for my time at my standard rate of \$325 per hour plus actual expenses. The opinions in this Reply Declaration are my own, and my compensation is not dependent in any way upon the outcome of the IPR of the ’206 patent.

II. PROFESSIONAL QUALIFICATIONS

3. I incorporate by reference the discussion of my professional qualifications (Section II) from my Opening Declaration.

III. MATERIALS CONSIDERED

4. My analysis is based on my years of education, research, experience, and background, as well as my investigation and study of relevant materials for this declaration. When developing the opinions set forth in this Reply Declaration, I was asked by counsel to assume the perspective of a person having ordinary skill in the art (“POSA”). I reviewed and considered the materials identified in the lists below.

Petitioners' Exhibits:

Exhibit	Description
1001	U.S. Patent No. 9,844,206
1002	Prosecution History of U.S. Patent No. 9,844,206
1005	Trevarthen, <i>The Importance of Utilising Electronic Identification for Total Farm Management: A Case Study of Dairy Farms on the South Coast of NSW</i> (Oct. 24, 2005) (Bachelor Thesis, University of Wollongong) (“ Trevarthen ”)
1006	U.S. Patent No. 7,059,275 to Laitinen et al. (“ Laitinen ”)
1008	U.S. Patent No. 6,059,733 to Brune et al. (“ Brune ”)
1009	U.S. Patent App. Pub. No. 2006/0267767 to Pohlkamp et al. (“ Pohlkamp ”)
1010	International Patent Pub. No. WO 2007/089184A1 to Liao (“ Liao ”)
1011	International Patent Pub. No. WO 2006/059916A2 to Buchanan et al. (“ Buchanan ”)
1013	International Patent Pub. No. WO 2004/066720 to Cross et al. (“ Cross ”)
1014	U.S. Patent App. Pub. No. US 2004/0233971 to Meads et al. (“ Meads ”)
1015	J.M. Bewley et al., <i>Comparison of Reticular and Rectal Core Body Temperature in Lactating Dairy Cows</i> , 91 J. Dairy Sci. 4661 (2008)
1016	L.C. Hicks et al., <i>Comparison of Methods of Measuring Deep Body Temperatures of Dairy Cows</i> , Livestock Environment VI: Proceedings of the 6th International Symposium 432 (May 2001)
1017	K.T. Higgins, <i>Temperature Readings by Remote Control</i> , Food Engineering 63 (May 2003)
1018	T. Mottram et al., <i>Technical Note: A Wireless Telemetric Method of Monitoring Clinical Acidosis in Dairy Cows</i> , 64 Computers and Electronics in Agriculture 45 (November 2008)

Exhibit	Description
1020	T.M. Brown-Brandl et al., <i>Telemetry System for Measuring Core Body Temperature in Livestock and Poultry</i> , 2001 ASAE International Meeting Sacramento, California, USA, Paper No. 01-4032 (July 30-Aug 1, 2001)
1021	D.J. Prendiville et al., <i>Radiotelemetry Systems for Measuring Body Temperature</i> , Beef Production Series No. 57 (June 2002)
1022	Amended Complaint, D.I. 25, <i>ST Reproductive Technologies, LLC d/b/a STinsight v. Smaxtec Inc. et al.</i> , No. 3:24-cv-00037 (W.D. Wis. Apr. 23, 2024)
1023	U.S. Patent No. 5,568,788 to van den Berg et al. (“ van den Berg ”)
1024	U.S. Patent App. Pub. No. 2006/0185605 to Renz et al. (“ Renz ”)
1025	U.S. Patent App. Pub. No. 2007/0271320 to Tsuyuzaki (“ Tsuyuzaki ”).
1026	U.S. Patent App. Pub. No. 2005/0145187 to Gray (“ Gray ”)
1027	R. Daly & M. Organ, <i>Research Online: Digital Commons as a Publishing Platform at the University of Wollongong, Australia</i> , 35 Serials Review 149-53 (2009).
1028	International Application No. PCT/NZ2007/000286, International Search Report (March 18, 2008)
1029	International Application No. PCT/NZ2007/000286, Written Opinion of the International Search Authority (March 18, 2008)
1032	R.M. de Mol et al., <i>Results of a Multivariate Approach to Automated Oestrus and Mastitis Detection</i> , 48 Livestock Production Science 219-227 (1997)
1033	R.M. de Mol et al., <i>Description of a Detection Model for Oestrus and Diseases in Dairy Cattle Based on Time Series Analysis Combined with a Kalman Filter</i> , 22 Computers and Electronics in Agriculture 171–185 (1999) (“ de Mol ”)
1034	J.E. Hillerton, <i>Detecting Mastitis Cow-Side</i> , National Mastitis Council Annual Meeting Proceedings 48-53 (2000)
1035	G.M. Hyde, <i>Milk Yield as a Factor in Dairy Herd Management</i> (1979) (Ph.D. dissertation, University of Illinois at Urbana-Champaign)

Exhibit	Description
1036	U.S. Patent No. 5,724,316 to Brunts
1037	Deposition Transcript of Timothy J. Bowser, Ph.D.
1038	Deposition Transcript of Meredith Knoff
1039	S. Bagley et al., <i>Logistic regression in the medical literature: Standards for use and reporting, with particular attention to one medical domain</i> , Journal of Clinical Epidemiology 54 (2001)
1040	Neter et al., APPLIED LINEAR STATISTIC MODELS (4th ed. 1996)
1041	Hair et al., MULTIVARIATE DATA ANALYSIS (5th ed. 1998)
1042	D. Schlünsen et al., <i>Automatic Health and Oestrus Control in Dairy Husbandry through Computer Aided Systems</i> , J. Agric. Engng. Res. 38 (1987)
1043	U.S. Patent Appl. Publ. No. 2003/0121972A1 to Lee et al.
1044	Help Google Search know the best date for your web page, <i>available at</i> https://developers.google.com/search/blog/2019/03/help-google-search-know-best-date-for
1045	U.S. Patent No. 6,342,242 to Allen et al.
1046	U.S. Patent No. 5,069,160 to Street et al.
1047	U.S. Patent No. 3,624,218 to Regelson
1048	J.H. Britt et al., <i>Determinants of Estrous Behavior in Lactating Holstein Cows</i> , J. Dairy Sci. 69 (1986)
1049	H. Lopez et al., <i>Relationship Between Level of Milk Production and Multiple Ovulations in Lactating Dairy Cows</i> , J. Dairy Sci. 88 (2005)
1050	E.H. Shim, <i>Milk Loss and Treatment Costs Associated with Two Treatment Protocols for Clinical Mastitis in Dairy Cows</i> , J. Dairy Sci. 87 (2004)
1051	A. Jamaludin, <i>Economics of feeding pasteurized colostrum and pasteurized waste milk to dairy calves</i> , Food Animal Economics Vol. 209, No. 4 (1996)
1052	A. Oresnik, <i>Effect of Health and Reproductive Disorders on Milk Yield and Fertility in Dairy Cows</i> (Sept. 1995)

Exhibit	Description
1053	J.L. Edwards et al., <i>Using Activity and Milk Yield as Predictors of Fresh Cow Disorders</i> , J. Dairy Sci. 87 (2004)
1054	U.S. Patent No. 7,905,832 to Lau et al.

Patent Owner's Exhibits:

Exhibit	Description
2001	Declaration of Dr. Tim Bowser
2002	<i>Curriculum Vitae</i> of Dr. Tim Bowser
2006	DOUG BANIA, BUSINESS VALUATION RESOURCES, LLC, THE COMPREHENSIVE GUIDE TO ECONOMIC DAMAGES, VOL. 2, CH. 38 (Jimmy S. Pappas et al. eds., 7th ed. 2023), https://nevium.com/wp-content/uploads/2023/12/Bania-Chapter-38.-Using-Internet-Analytic-Tools-for-Valuation-and-Damages-Calculations-in-Internet-IP-Infringement-and-Defamation-Cases.pdf
2007	Emory University, Goizueta Business School, <i>Become a Google Power User: Tips and Techniques</i> , https://libraries.emory.edu/media/5321
2008	A.M. Bellon, <i>Does animal charisma influence conservation funding for vertebrate species under the US Endangered Species Act?</i> , Environmental Economics and Policy Studies (2019)
2009	Declaration of Dr. Timothy J. Bowser, Ph.D. in Support of Patent Owner Response
2010	Deposition Transcript of Tami M. Brown-Brandl, Ph.D. (January 29, 2025)
2011	Declaration of Meredith Knoff
2012	<i>Curriculum Vitae</i> of Meredith Knoff
2013	Dorothea Salo, <i>Innkeeper at the Roach Motel</i> , 57 Libr. Trends 98 (2008), https://dx.doi.org/10.1353/lib.0.0031
2014	Kwame Kodua-Ntim, <i>University Academics' Usage of Open Access Institutional Repositories</i> , 30 J. Libr. Res. Sharing 101 (2021), https://doi.org/10.1080/1072303X.2022.2103227

Exhibit	Description
2015	Alex Wood-Doughty et al., <i>Do Download Reports Reliably Measure Journal Usage? Trusting the Fox to Count Your Hens?</i> , 80 Coll. & Rsch. Librs. 694 (2019), https://doi.org/10.5860/crl.80.5.694
2016	<i>Frequently Asked Questions on Public Statistics</i> , Cornell Univ.: arXiv, https://info.arxiv.org/help/faq/statfaq.html
2017	<i>In-depth guide to how Google Search works</i> , Google Search Cent., https://developers.google.com/search/docs/fundamentals/how-search-works
2018	<i>Our new search index: Caffeine</i> , Google Search Cent., https://developers.google.com/search/blog/2010/06/our-new-search-index-caffeine (June 9, 2010)
2019	<i>Facts about Google and Competition: How Google Search Works</i> , Google, https://web.archive.org/web/20111104131332/https://www.google.com/competition/howgooglesearchworks.html (Mar. 19, 2016)
2020	<i>Grey Literature (in the Health Sciences)</i> , USC Librs.: Rsch. Guides, https://libguides.usc.edu/healthsciences/grey_literature
2021	Yazdan Mansourian & Nigel Ford, <i>Search persistence and failure on the web: a “bounded rationality” and “satisficing” analysis</i> , 63 J. Documentation 680 (2007), https://www.emerald.com/insight/content/doi/10.1108/00220410710827754/full/html

IPR Filings:

Paper	Description
1	Petition for IPR
8	Patent Owner’s Preliminary Response
12	Petitioners’ Reply in Support of Petition for IPR
15	Patent Owner’s Sur-Reply
18	Institution Decision
22	Patent Owner’s Response

IV. OPINIONS RELATING TO PUBLIC AVAILABILITY

5. I understand that it is Patent Owner’s position that Trevarthen was not publicly available prior to September 15, 2008, or September 15, 2009. Counsel for Petitioners asked me to provide some opinions regarding the public availability of Trevarthen.

A. Date-Limited Search Engine Searching

6. Patent Owner’s expert Meredith Knoff opines that “this date-limiting search functionality on Google is a helpful proxy for gauging what search results Google were relevant—or not relevant—in a specific time period. In other words, a reference that populates as a search result in response to a date-limited search supports that the reference existed and was relevant (i.e., findable) during that time period, whereas a reference that does not populate as a search result supports that the reference either did not exist or was not relevant (i.e., not findable) during that time period.” Ex. 2011, ¶ 33. I disagree with Ms. Knoff. Date-limited searches run on Google today are not an accurate representation of what a Google search would or would not have located if performed during the actual date-limited time period.

7. As proof of the unreliability of date-limited searches on Google, I re-ran some of the same searches performed by Ms. Knoff,¹ and the search results turned up references that were clearly *not* from the date-limited time period. As shown below, papers from 2015 and later appeared in searches that were date limited to before 2009. These results tell me that date-limited time searches are *not* necessarily an accurate proxy for what a Google search would have turned up in an earlier time period.

8. For example, the search string “RFID AND (cattle OR livestock) AND temperature” between January 1, 2006, and September 15, 2009, produced 383 results. The second result was a paper written in 2022—clearly not between January 1, 2006, and September 15, 2009:

¹ I turned “incognito” mode on for these searches so my prior search history would not affect the searches.

Google

RFID AND (cattle OR livestock) AND temperature after:2006-01-01 before:2009-09-15

All Images Videos Short videos Shopping Forums News More

Tools

Any time All results Advanced Search

About 383 results (0.15 seconds)

Michigan State University
https://www.canr.msu.edu/uploads/Radio_Freq... PDF

Radio Frequency Identification Ear Tag Application and ...
Jul 17, 2006 — The RFID tag also is applied to a thicker portion of the animal's ear than most bangle tags. When applying tags in cold weather, storing the RFID tags at room.
2 pages

MDPI
https://www.mdpi.com/... PDF

Non-Invasive Methods of Quantifying Heat Stress ...
by V Sejian · 2022 · Cited by 40 — Further, a neural network model was used on data from radiofrequency identification (RFID) sensors along with automatic milking system data to track cows.

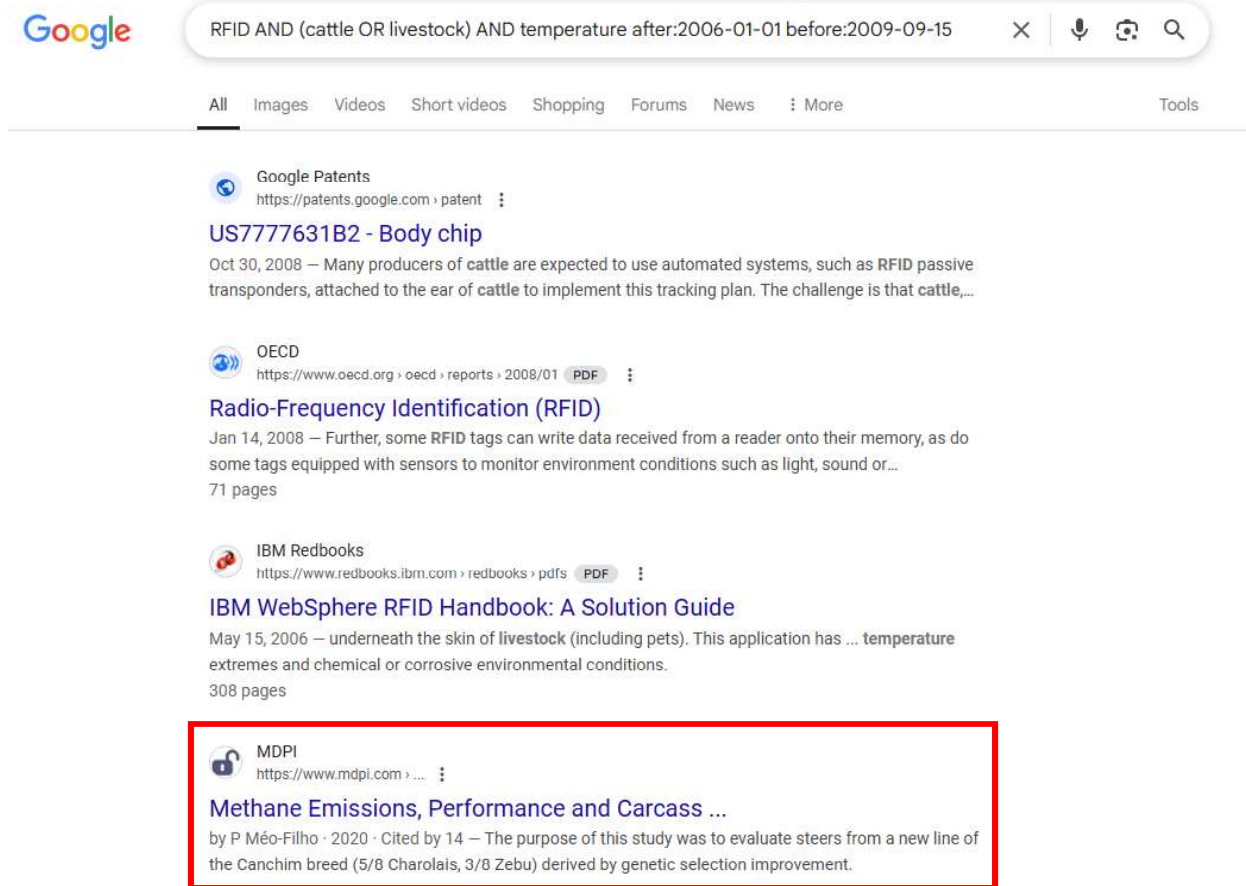
National Institute of Standards and Technology (.gov)
https://nvlpubs.nist.gov/nistpubs/legacy/nists... PDF

Guidelines for Securing Radio Frequency Identification (RFID ...
by T Karygiannis · Cited by 273 — livestock. Factors to consider include: • The general functional objective ... such as temperature, humidity, or shock. Information from the sensors ...
154 pages

STAR Systems International
https://star-int.net/star-systems-rfid-university

SSI University
Aug 20, 2007 — An RFID tag equipped with a temperature sensor might be able to predict the actual expiration date of a carton of milk, for example, which may be very different ...

The fourth result on the third page of results was also a paper from 2020:



9. As another example, the search string “RFID AND bolus AND cattle” between January 1, 2006, and September 15, 2009, produced 115 results. The bottom result on the first page of the search results was a paper from 2020:

Google

RFID AND bolus AND cattle after:2006-01-01 before:2009-09-15

All Images Videos Shopping Short videos Forums Web More Tools

Any time All results Advanced Search About 115 results (0.22 seconds)

The Beef Site
<https://www.thebeefsite.com/articles/radio-frequenc...>

Radio Frequency Identification for Beef Cattle
 Jun 29, 2006 — The three common physical forms of RFID transponders are ear tags, injectable transponders, and rumen boluses. All of these RFID transponders contain an ...

Ranchers.net
[https://www.ranchers.net/.../Cattle & Livestock Forum](https://www.ranchers.net/.../Cattle%20Livestock%20Forum)

Microchips
 Oct 6, 2006 — They are using Digital Angel RFID and the ScoringAg database to be able to ship beef to Europe. Their national dairy herd is about 7 million head with other ...

California Department of Food and Agriculture - CDFA (.gov)
https://www.cdfa.ca.gov/animal_health/pdfs/PDF

National Animal Identification System (NAIS)— A User Guide ...
 Dec 15, 2007 — Radio Frequency Identification (RFID): An identification device that utilizes radio frequency technology. The RFID device includes ear tags, bolus, implants.
 64 pages

Food and Agriculture Organization
<https://www.fao.org/.../PDF>

Animal identification practices
 Jul 2, 2007 — RFID boluses. Microtransponders can also be placed inside ceramic boluses which can be dosed to young ruminant animals and remain permanently in the ...
 13 pages

Google

RFID AND bolus AND cattle after:2006-01-01 before:2009-09-15

Nov 1, 2007 — There are two different types of NLIS devices approved for cattle: 1. ear device — applied as a tag to the right. (offside) ear of the animal; 2. rumen bolus — ...
 3 pages

National Agricultural Law Center
<https://nationalaglawcenter.org/assets/articles/PDF/>

A Comparison of International Animal Identification Programs
 by E Pendergrass · 2007 · Cited by 2 — ... Cattle Tracking System is administered by the British Cattle Movement Service, that scans farmer's applications for cattle passports and registers cattle.
 9 pages

meatprojects.com
<https://meatprojects.com/docs/NewZealand/r.../PDF>

Pathfinder - Report UHF Animal Tag Trials - Meat Project
 Jul 16, 2008 — Many governments are encouraging or mandating the use of RFID tags to track cattle, pigs, sheep and deer to protect their food supply chain from contamination ...
 53 pages

Animal and Plant Health Inspection Service (.gov)
<https://www.aphis.usda.gov/document/file/PDF>

National Animal Identification System (NAIS) - APHIS - USDA
 Nov 23, 2006 — For example, animal identification number (AIN) devices for cattle may range from \$1 for visual identification tags to \$2-\$3 for devices with radio ...
 Missing: bolus | Show results with: bolus

MDPI
https://www.mdpi.com/...

Non-Invasive Methods of Quantifying Heat Stress ...
 by V Sejian · 2022 · Cited by 40 — Further, a neural network model was used on data from radiofrequency identification (RFID) sensors along with automatic milking system data to track cows.

10. Patent Owner may contend that this shows only that *extra* results may appear in date-limited searches, not that correct results would be omitted. I disagree. If it presents a paper from 2022 as being from between 2006 and 2009, Google could just have easily omitted relevant results from the correct time period, such as results that may not have been indexed with a correct date or a date at all.

B. Locating Trevarthen on Search Engines Such as Google Scholar

11. All of the searching performed by Patent Owner's experts was done on Google. I did not see any attempt to perform searching on Google Scholar, which was an available search engine prior to 2009. I remedied this omission by performing some of my own searches on Google Scholar.

12. While I am not aware of a feature in Google Scholar to show when a particular reference was uploaded, I ran some of the search terms used by Ms. Knoff on Google Scholar, and filtered to exclude results dated *after* 2009 (to eliminate articles that would not have shown up in a search in 2009), and in each instance Trevarthen was one of the top search results. These search results, along with the fact that Trevarthen has been available on Research Online since 2006, further support my opinion that Trevarthen was indexed and locatable on a search engine between 2006 and 2009.

13. Below are images of where Trevarthen came up in each of the searches I performed:

Google Scholar

RFID AND (cattle OR livestock) AND temperature

Articles

Page 4 of about 2,690 results (0.07 sec)

Any time

Since 2025

Since 2024

Since 2021

Custom range...

2009

Search

Sort by relevance

Sort by date

Any type

Review articles

☐ include patents

☒ include citations

Create alert

[PDF] The importance of utilising electronic identification for total farm management: A Case study of dairy farms on the south coast of NSW

A Trevarthen - 2005 - ro.uow.edu.au

... (RFID) is becoming globally recognised as the technology to implement animal identification and has become a mandatory form of livestock ... for RFID to be utilised as a temperature ...

☆ Save Cite Cited by 7 Related articles All 4 versions

[PDF] academia.edu

Injectable electronic identification, monitoring, and stimulation systems

PR Troyk - Annual Review of Biomedical Engineering, 1999 - annualreviews.org

... for which the IPTT-100 cansense temperature is 90–110F, and ... temperature sensing make the IPTT-100 a unique RFID tag; ... the use of injected RFID tags in livestock anddomestic pets. ...

☆ Save Cite Cited by 130 Related articles All 6 versions

[PDF] asas.org

[PDF] EFFECT OF DECREASING TEMPERATURE ON THE READABILITY OF SIX DIFFERENT RADIO FREQUENCY ELECTRONIC IDENTIFICATION ...

LE Wallace, JA Paterson, R Clark, A Kellom... - ... SOCIETY OF ANIMAL ..., 2006 - asas.org

... frequency identification (RFID) ear tags were evaluated using five handheld stick readers at three temperatures (20 ... Livestock are often subjected to a variety of conditions including low ...

☆ Save Cite Cited by 2 Related articles All 2 versions

Research on mobile commerce based on RFID

W Guo - 2008 IEEE International Conference on Service ..., 2008 - ieeeexplore.ieee.org

... Then devices will sense the environment changes such as the temperature, ... for RFID tags is in livestock and animal control. Currently, such devices are being implanted into the livestock...

☆ Save Cite Cited by 8 Related articles



Any time
 Since 2025
 Since 2024
 Since 2021
 Custom range...
 — 2009

 Sort by relevance
 Sort by date
 Any type
 Review articles
☐ include patents
☒ include citations
☒ Create alert

[PDF] RFID technology used for identification and **temperature** monitoring of **cattle**

[PDF] usab-tm.ro

I Hutu, F Ionescu, A Cimponeriu... - Lucrari Stiintifice Medicina ..., 2009 - usab-tm.ro
 ... the best implantation location of the RFIDs for **cattle** identification and for the most accurate body **temperature** determination. For this study 19 **RFID** devices have been implanted in 4 (...)
 ☆ Save Cite Cited by 11 Related articles All 3 versions

Assessment of an injectable **RFID temperature** sensor for indication of horse well-being

[PDF] researchgate.net

JR Marsh, BS Gates, GB Day, GE Aiken... - Livestock ..., 2009 - elibrary.asabe.org
 ... identification (RFID) and **temperature** sensor to monitor the body **temperature** of horses. ... (accuracy and repeatability) of the **temperature** readings. Results of four separate calibration ...
 ☆ Save Cite Cited by 16 Related articles All 13 versions

Core body **temperature** monitoring with passive transponder boluses in beef heifers

[PDF] cdnsciencepub.com

JA Small, AD Kennedy... - Canadian journal of animal ..., 2008 - cdnsciencepub.com
 ...) **temperatures** (BTr) obtained with a **cattle temperature** monitoring system (MaGiIX). Magnetic, inductively coupled full duplex radio-frequency identification (RFID... behavior in **dairy** cows ...
 ☆ Save Cite Cited by 30 Related articles All 4 versions

The **RFID-enabled dairy** farm: towards total farm management

[PDF] uow.edu.au

A Trevvarthen, K Michael - 2008 7th International Conference on ..., 2008 - ieeexplore.ieee.org
 ... This paper provides a view of how an **RFID-enabled dairy** ... (national **livestock** identification system) compliant **dairy** farms ... At a basic level, a **temperature** sensing **RFID** device could be ...
 ☆ Save Cite Cited by 63 Related articles All 8 versions

Operation of **RFID** in cold environment

HES Haapala - Livestock Environment VIII, 31 August-4 ..., 2009 - elibrary.asabe.org
 ... It was easier to attach the tags in **dairy cattle** than in beef **cattle**. ... of the **RFID** devices tested was not affected by different types of **cattle** kept at extreme **temperature** and humidity ...
 ☆ Save Cite Cited by 3 Related articles All 2 versions

Rectal **temperature** measurement versus peripheral **temperature** sensing using radio-frequency implants in periparturient **dairy cattle**.

ED Reid, KE Karvetski, JM Velasco... - Journal of Animal ..., 2006 - search.ebscohost.com
 ... **Temperatures** recorded from these RFI exhibit a positive correlation with baseline rectal **temperatures** and a negative correlation to rectal **temperature** when **cattle** are challenged with ...
 ☆ Save Cite Cited by 2 Related articles

[PDF] The national **livestock** identification system: the importance of traceability in e-business

[PDF] redalyc.org

A Trevvarthen - Journal of Theoretical and Applied Electronic ..., 2007 - redalyc.org
 ... Frequency Identification (RFID) can be utilized on **dairy** farms to enhance total ... **temperature** readings when interrogated by an **RFID** receiver/scanner. The article considers **temperature** ...
 ☆ Save Cite Cited by 51 Related articles All 8 versions

[PDF] The importance of utilising electronic identification for total farm management: A Case study of **dairy** farms on the south coast of NSW

[PDF] uow.edu.au

A Trevvarthen - 2005 - ro.uow.edu.au
 ... an ideal framework for the use of **RFID** technology for total farm ... for **livestock** – a system based on the use of **RFID** devices: ... the possibility for **RFID** to be utilised as a **temperature** sensing ...
 ☆ Save Cite Cited by 7 Related articles All 4 versions

Google Scholar

RFID AND cattle AND temperature

Articles

Page 9 of about 2,490 results (0.10 sec)

Any time

Since 2025

Since 2024

Since 2021

Custom range...

— 2009

Search

Sort by relevance

Sort by date

Any type

Review articles

☐ include patents
 ☒ include citations

☒ Create alert

Health factors associated with microchip insertion in horses

[PDF] psu.edu

MI Gerber - 2009 - etda.libraries.psu.edu

... Since the use of Radio Frequency Identification (RFID) tags began, other opportunities have ...

 ... Body **temperature** recordings from **cattle** with rumen boluses and tympanic (ear) transmitters ...

 ☆ Save Cite Cited by 1 Related articles All 2 versions

[PDF] The use of infrared thermography as an early indicator of

[PDF] researchgate.net

AL Schaefer, NJ Cook, JS Church, J Basarab, B Perry... - researchgate.net

... Both absolute and mean ratio infrared val340 ues are displayed compared to several other ...

 ... commonly used 341 predictors of disease in **cattle** including core **temperature**, 342 white ...

 ☆ Save Cite Related articles

Smart packaging of meat and poultry products

SA Hogan, JP Kerry - Smart packaging technologies for fast ..., 2008 - Wiley Online Library

... Bioett has developed a system based on a biosensor for **temperature** ... of RFID technology.

 ... At present, a number of countries are using **RFID** to trace individual animals (mainly **cattle**) ...

 ☆ Save Cite Cited by 113 Related articles All 5 versions

[book] Integration and validation of a radio frequency identification (RFID) system and automatic sorting technology (AST) for real time correlation of management ...

[PDF] academia.edu

RH Destajo - 2007 - search.proquest.com

... **RFID** tags were first used in livestock to track **cattle** (Bonsor, nd). Early animal transponders ...

 ... Passive and active **RFID** microchips designed to determine animal body **temperature** have ...

 ☆ Save Cite Cited by 1 Related articles All 4 versions

A new information system for tracing geolocations of bovine cattle

[PDF] hal.science

M Visoli, S Termes, JP Chanet, F Pinet... - ... : Atelier Systèmes d' ..., 2009 - hal.science

... geolocation of an animal when a transporter scans its **RFID** tag with a specific device (see ...

 ... ATQ ... Their weight and their body **temperatures** are periodically observed. Moreover, different ...

 ☆ Save Cite Cited by 1 Related articles All 10 versions

Radio-frequency identification applications in construction industry

EJ Jaselskis, MR Anderson, CT Jahren... - Journal of ..., 1995 - ascelibrary.org

... on radio-frequency identification (RFID) and its potential ap... ear tags of standard breeds of ...

 ... **cattle** as well. And more recently... **Temperature** transducers could be placed in the concrete ...

 ☆ Save Cite Cited by 297 Related articles All 7 versions

[CITATION] 868MHz 915MHz Anti-Collision OEM UHF Machine Identification RFID Metal Tag

EE Garcia, C Kimura, AC Martins, GO Rocha... - Brazilian Archives of ..., 1999 - Tecpar

☆ Save Cite Related articles

[CITATION] Cattle Horse Kangaroo Sheep Fence/Livestock Farm Fence/Wire Mesh

JM Osepchuk - 1980

☆ Save Cite Related articles

[PDF] The importance of utilising electronic identification for total farm management. A Case study of dairy farms on the south coast of NSW

[PDF] uow.edu.au

A Trevarthen - 2005 - ro.uow.edu.au

... of **cattle** traceability in the world. However, it is proposed that producers go beyond mere ...

 ... compliance, and take advantage of the **RFID** ... for **RFID** to be utilised as a **temperature** sensing ...

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MM Schutz, JM Bewley - Tri-State Dairy Nutrition Conference, 2009 - researchgate.net
... TM Cattle Temperature Monitoring System (CTMS; MaGiiX Inc., Post Falls, ID) utilizes RF identification (RFID) technology within a rumen bolus, a ... inert CTMS bolus resides in the cow's ...
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[PDF] The importance of utilising electronic identification for total farm management: A Case study of dairy farms on the south coast of NSW [PDF] uow.edu.au
A Trevarthen - 2005 - ro.uow.edu.au
... of cattle traceability in the world. However, it is proposed that producers go beyond mere compliance, and take advantage of the RFID ... for the use of RFID technology for total farm ...
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C. Download Counts for Trevarthen

14. I have reviewed printouts of the page from Research Online hosting Trevarthen and see that it had been downloaded 324 times by September 7, 2007, and 569 times by March 22, 2008. Ex. 1030, 13, 15.

15. I reviewed the deposition transcript of Patent Owner's expert Meredith Knoff. In her deposition, Ms. Knoff testified that download counts for the

Trevarthen may be artificially inflated because a single person could have downloaded the article between 10 and 15 times. Ex. 1038, 64:10–16. I have seen no evidence to suggest that the download counts for Trevarthen are not accurate. Furthermore, even if a single individual downloaded Trevarthen multiple times, it would likely be because he or she is a person of ordinary skill in the art and interested in the subject matter of Trevarthen. I do not believe a person would download Trevarthen multiple times unless Trevarthen was relevant or closely related to the work he or she was doing.

D. Trevarthen on the International Search Report

16. I understand that Trevarthen was identified in 2008 on an International Search Report (ISR) prepared by the Australian Patent Office. Ex. 1028; Ex. 1029. The ISR contains an entry for “Electronic data base consulted during the international search (name of data base and, where practicable, search terms used).” Ex. 1028, 1. According to the ISR, the databases consulted were: DWPI, internet, AusPat, Patent Lens, PCT Gazette, Esp@cenet, and GetThePatent. *Id.*

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DWPI, internet, AusPat, Patent Lens, PCT Gazette, Esp@cenet, GetThePatent "cattle, rfid, gate etc."		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Trevarthen, A., ‘The Importance of Utilising Electronic Identification for Total Farm Management: A Case Study of Dairy Farms on the South Coast of NSW’, 2005. See url: < http://ro.uow.edu.au/cgi/viewcontent.cgi?article=1000&context=thesesinfo >. Entire document.	1-25

17. I have investigated each of these databases and, other than the internet, it is my understanding that they are databases for searching *patents* or *patent applications*, not scholarly publications like Trevarthen. For example, based on my investigation, I understand “DWPI” to refer to “Derwent World Patents Index,” a database containing patent applications and grants from several of the world’s patent issuing authorities. AusPat, Patent Lens, PCT Gazette, Esp@cenet, and GetThePatent are similarly patent-searching databases. Thus, based on the disclosure of the ISR, a POSA would understand that the examiner most likely located Trevarthen through internet searches using terms such as “cattle,” “rfid,” “gate,” etc.

V. OPINIONS RELATING TO THE TREVARTHEN-BASED GROUNDS

A. Combining Temperature and Milk Production for Estrus or Illness Detection

18. In its Response, Patent Owner contends that “there is nothing in the record to support that combining temperature and milk production enhances illness detection.” POR, 26. I disagree. As I explained in my Opening Declaration, citing to references such as de Mol (Ex. 1033), “sophisticated multivariate expressions were known in the art that considered both temperature and milk yield to determine whether an animal was ill or in oestrus.” Opening Declaration, ¶ 119.

19. Patent Owner argues that “de Mol expressly cautions against using his theoretical model in any ‘practical application’ because it generates too many ‘false

positive alerts.” POR, 28. I disagree. de Mol begins by teaching a POSA the general proposition that relying on more than one variable (including milk yield, milk temperature, electrical conductivity of milk, animal activity, and feed intake) is important for distinguishing between oestrus, mastitis, other infective diseases, metabolic diseases, and lameness. Ex. 1033, 172. de Mol then provides an example of a single integrated expression that enables multivariate analysis for the detection of illness and/or estrus. *Id.*, 174–80. de Mol, in fact, “implemented and tested” its model and states that “results for [detection of] oestrus are satisfying.” *Id.*, 182. While de Mol explains that there may have been too many false positives “for practical implementation,” de Mol does not denigrate the entire idea of its multivariate analysis. *Id.* To the contrary, de Mol suggests using (but improving) its model. *Id.*, 182–84. False positives would not be a reason to completely abandon a model.

20. Prior to the ’206 patent, it was foundational knowledge in the art that relying on multiple variables (*e.g.*, temperature *and* milk production together) provided better predictions (*e.g.*, of illness) than a single variable alone (*e.g.*, only one of temperature *or* milk production). In addition to de Mol, this knowledge is reflected in the following references:

- Bagley, *Logistic regression in the medical literature: Standards for use and reporting, with particular attention to one medical domain* (2001): “For a

given set of data, introducing more variables will generally produce a model better fit to the data” Ex. 1039, 980.

- Neter, *Applied Linear Statistical Models* (1996): “[W]e frequently find that predictions of the response variable based on a model containing only a single predictor variable are too imprecise to be useful [a] more complex model, containing additional predictor variables, typically is more helpful in providing sufficiently precise predictions of the response variable.” Ex. 1040, 217.
- Hair, *Multivariate Data Analysis* (1998): “We have shown how improvements in prediction of the dependent variable are possible by adding independent variables” Ex. 1041, 172.
- Schlunsen, *Automatic Health and Oestrus Control in Dairy Husbandry through Computer Aided Systems* (1987): “The milk temperature reacted 12 h after the infection with an increase of 0-8 K and reached a higher level in the further experiment. The milk quantity was measured and a yield depression of about 5 kg was observed after the infection was triggered. ... Since a variety of factors have an effect on the milk temperature this parameter alone is not sufficient for oestrus diagnosis. ... The simultaneous recording of the following parameters is to be recommend for oestrus monitoring ... milk temperature; milk yield” Ex. 1042, 272, 275, 278.

I note that milk temperature is highly correlated with body temperature. Indeed, by definition, milk temperature is at body temperature as it leaves the body. Thus a POSA would understand that it would be desirable to measure body temperature instead of or in addition to milk temperature, and that body temperature could take the place of milk temperature in a multivariate analysis.

B. “Health Information”

21. Patent Owner argues that “a skilled artisan would not equate treatment history in Trevarthen with ‘health information’ data for use in the claimed logical expression.” POR, 36. I disagree, including for the reasons in my Opening Declaration (§§ 133–135). A history of medical treatment, such as administration of medications such as penicillin, would be considered “health information” by a POSA. Such information provides critical details about the animal’s medical background, which is essential for ensuring appropriate care. This information helps make informed decisions about future treatments, prevent adverse drug interactions, and monitor the effectiveness of ongoing health interventions. For example, U.S. Patent Publication No. 2003/0121972 teaches that “health information ... is information on emergency, vaccination, medical history, emergency records, medical treatment, prescription, examination and medication.” Ex. 1043, ¶ 0091.

22. In addition to treatment history, a POSA would have understood that using the data stream from milk production provides insights and information on

individual animal health and illness. For example, Trevarthen teaches that “a cow producing significantly less milk than her calculated average may be suffering from an illness.” Ex. 1005, 98; *see also* Ex. 1023 (van den Berg), 4:12–21 (milk yield related to estrus and illness); Ex. 1045 (U.S. Patent No. 6,342,242), 5:58–61 (“However, animals which graze infected fescue often had low weight gain, reduced milk production, lowered conception rates and other health problems.”); Ex. 1046 (U.S. Patent No. 5,069,160), 3:55–57 (“Also milk from each quarter can be measured and checked to improve monitoring of yield and animal health.”).

C. Obtaining Date-Time Information from RFID Devices

23. In my deposition, I testified that there were reasons one would want to retrieve data-time information from an RFID device at the reader, as well as reasons one would want to retrieve the information from the device itself. Ex. 2010, 150–152 (“There are other reasons that you would want to have the time-date on the device itself. And if you want me to explain that, I can explain that as well.”).

24. One of the reasons I was referring to in my deposition was that retrieving information from the device itself ensures that the temperature data is accurately recorded at the moment it is taken (as opposed to when it was reported), providing precise and reliable health monitoring for the cow. This is crucial for tracking changes in the cow’s condition over time and identifying any potential health issues promptly. Furthermore, retrieving date-time information from the

device allows multiple measurements to be taken and stored in the device, and then collectively transmitted to the reader. Taking multiple measurements between reporting furthers the purpose of Trevarthen to detect illness based on a time-series of measurements.

25. Patent Owner argues that “a system with device-based timers is more complex and more prone to failure due to issues such as limited battery life, unsynchronized timers, and the need to communicate with the reader.” POR, 49. In the context of Trevarthen and the purposes of the measurements taken and reported in Trevarthen, I disagree. Perfectly synchronized timers are not required to detect diseases in individual animals. Rather, what matters is the time-series of measurements for individual animals. The “drift” I testified about in my deposition would not dissuade a POSA from trying device-based time-stamping as taught in Brune. Brune also does not mention issues of battery life, as suggested by Patent Owner. To the contrary, Brune states that its bolus provides data over “an extended period of time.” Ex. 1008, 3:37–43, cls. 4–9. Thus, a POSA would not have been dissuaded from using Brune’s device-based time-stamping in Trevarthen’s system.

VI. OPINIONS RELATING TO THE LAITINEN-BASED GROUNDS

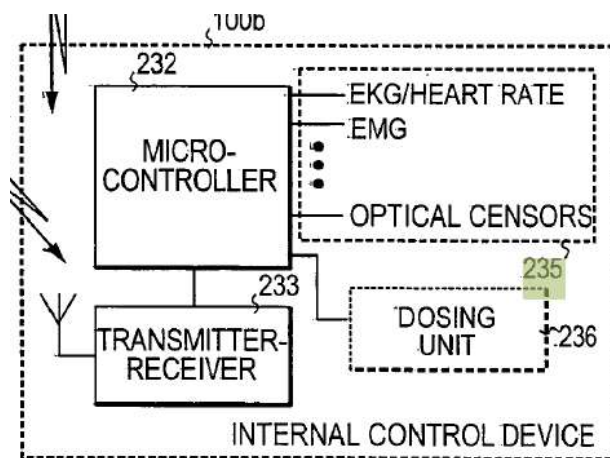
A. Laitinen's Disclosure of Implant-Based Temperature Measurements

26. As explained in my Opening Declaration, a POSA reading Laitinen would have understood that Laitinen discloses implanted temperature-sensing devices. Opening Declaration, ¶¶ 70–71, 193–195.

27. For example, Laitinen teaches a “pico level device,” which may include a “[s]ensor unit connected to the micro controller for the surveillance of the animal’s body temperature, occlusion, muscular action, motion or metabolic level. The [s]ensor unit can also be an implant inside the animal, in which case the data it provides can be, for instance, read/transcribed by the pico level equipment using the so-called Radio Frequency Identification Technology.” Ex. 1006, 3:51–62.

28. A POSA would similarly understand that the implanted control device of Figure 2 measures temperature. Figure 2 shows “two different pico level devices,” one of which is external (100a) and the other that is “implanted inside the animal’s tissue (100b).” *Id.*, 5:38–43. As shown below, the “internal control device” of Figure 2 (100b) includes three placeholders (“...”) in box 235 (highlighted below) for additional sensors (other than EKG/heart rate, EMG, and optical sensors), and Laitinen discloses that one allowable sensor in its devices is for temperature. *Id.*, 3:51–52, 5:38–55, 8:9–11. A POSA would thus understand Laitinen to disclose (as

one of the “...” sensors) a temperature sensor, such that the internal control device of Laitinen has temperature measuring capabilities.



Id., Fig. 2 (excerpted and annotated).

B. Combination of Laitinen and Liao

29. Patent Owner argues that “Liao does not teach that ‘milk production and days in milk information are also useful for determining whether a cow is in heat and ready for artificial insemination’ [because] Liao uses milk yield and DIM solely as an input to make an ‘insemination decision,’ which is different from detecting heat.” POR, 52. I disagree that this would dissuade a combination. Heat and insemination decisions are closely related. For example, in Liao, “whether the animal is in heat” is, along with DIM and peak milk yield, an “input parameter” to the insemination decision. Ex. 1010, 9–12.

30. In Liao, an insemination decision is based on, among other things, DIM, milk yield, and a heat-detection status. *Id.*, 20–21 (claim 10). Laitinen teaches an expression for determining heat based on temperature. Ex. 1006, 8:5–12. Thus,

when Laitinen's expression is combined with that of Liao (e.g., nested within Liao's insemination determination), both temperature and milk information are considered.

31. Separately, as explained in my Opening Declaration, a POSA would have been aware prior to the '206 patent that lowered milk production was an indicator of illness, or related conditions such as heat stress. Therefore, a POSA would have been motivated to modify the second logical expression of Laitinen (which seeks to determine an appropriate medical treatment for an animal) to include milk yield as an input, along with temperature. As explained above, it was well known for decades that a combination of variables was likely to improve reliability of a logical expression that determines whether a cow is ill and advising on medical treatments.

32. It is also my opinion, as explained in my Opening Declaration, that a POSA would be able to rely on the combined teachings of Laitinen and Liao to combine temperature and milk production as input variables to a new logical expression for the detection of heat or illness. Opening Declaration, ¶ 189. Thus, my opinions with respect to combining Laitinen and Liao are not limited to modifying the specific logical expressions disclosed in those references. To the contrary, it was within the skill of a POSA to develop his or her own logical expression, based on the teachings of Laitinen and Liao, that would detect, *inter alia*, illness.

33. It was well known to a POSA that milk yield (like temperature) was correlated with illness and estrus. *See, e.g.*, Ex. 1052, 44 (“[M]ilk production in herds analyzed was significantly reduced in cases of mastitis.”); Ex. 1053, 528 (“milk yields of sick cows were lower ($P < 0.01$) than milk yields of healthy cows.”); Ex. 1048, 2195, 2201; Ex. 1049, 2792 (Fig. 6). Therefore, a POSA would have been motivated to modify Laitinen or “create a new” expression that included both temperature and milk production information as input variables to detect estrus or illness. Ex. 1033, 172; Ex. 1042, 170–74 (“[M]ilk temperature and yield are both of importance and enhance prediction model for estrus detection for cows.”).

34. I note that Patent Owner appears to misunderstand the disclosure from Liao. Liao states: “On the contrary, many other factors may have impact on an actual insemination decision for a particular animal. However, often the farmer himself/herself is not explicitly aware of exactly which these factors are, or how they influence the insemination decision. Therefore, it may be practically impossible to formulate a Boolean, or other mathematical model, for the decision process.” Ex. 1010, 1. Patent Owner appears to interpret the “impossible to formulate” language to mean that no one, not even a POSA, could formulate a Boolean model to determine whether to inseminate a cow. *See* POR, 53–54. I disagree. A POSA would understand Liao to teach that “the farmer himself/herself” is not able to formulate a Boolean, prior to the invention disclosed in Liao. Liao seeks to

“alleviate[] the above problems” and offer a solution that farmers can use to determine whether to inseminate. Ex. 1010, 2–5 (“This system is advantageous because it is capable of modeling decision processes that cannot be explicitly formulated. ... The output data produced by the decision engine includes ... a second output parameter reflecting whether the animal having this identity should be inseminated within a particular time period.”). Thus, there is nothing about Liao’s parameters that would dissuade a POSA from using them in an expression, such as that of Laitinen.

35. Finally, Patent Owner states, “when a cow is given medication, its milk is typically withdrawn from production. When that occurs, no milk production data is measured.” POR, 55. This is incorrect. A POSA would have understood that even medicated animals are milked, with the milk then discarded. Ex. 1005, 81; Ex. 1050 [Shim (2004)], 2702–03; Ex. 1051 [Jamaluddin (1996)], 751. In my experience, even the yield of the discarded milk is still measured and tracked. *See id.*

C. Temperature as “Health Information”

36. In the context of the ’206 patent, a POSA would have considered health information to include vital signs such a temperature. As discussed in my Opening Declaration and elsewhere in my Reply Declaration, a cow’s temperature correlates with health. *E.g.*, Opening Declaration, ¶¶ 113–116, 186; *see also* Ex. 1008, 1:36–

38 (“the core body temperature of a cow may rise when the cow is sick ...”); Ex. 1023, 4:12–18 (temperature is a reliable indicator of illness). I additionally note that U.S. Patent No. 7,905,832 refers to temperature as “health information.” Ex. 1054, 7:50–53, 16:28–30.

VII. CONCLUSION

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code.

Date: May 16, 2025



Digitally signed by Tami
Brown-Brandl
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Tami M. Brown-Brandl, Ph.D.