September 9, 2025

smaXtec Inc. and smaXtec Animal Care GmbH

v.

ST Reproductive Technologies, LLC

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

IPR2024-00885
U.S. Patent No. 8,823,515

Demonstrative Exhibit – Not Evidence

GIBSON DUNN

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’206 Patent: Grounds 1 & 2

Ground 1: Trevarthen Renders Obvious Claims 1-4 and 6

Ground 2: Trevarthen + Brune Renders Obvious Claims 17-20

01

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Trevarthen Discloses a "Total Farm Management" System

1[pre] "A computer implemented animal management system, comprising"

The Importance of Utilising Electronic Identification for Total Farm Management: A Case Study of Dairy Farms on the South Coast of NSW.

Author: Adam Trevarthen

6.2.2. Herd Management Software

The ability to digitally store herd information is certainly a valuable tool for all farms, and a necessity for those desiring to utilise RFID to aid in farm management. Herd management software provides farmers with this ability, providing mechanisms for them to store individual cow data into a database. Data can be entered into this software application manually via an easy to use, standardised interface, or alternatively (and predominantly for the purposes of this framework), data can be automatically entered through the use of other digital devices (such as milk meters, cow weight scales – discussed later in this chapter) linked to this database.

Ex. 1005 (Trevarthen), 100

Pet., 11-12

Trevarthen's Farm Management System Uses a Processor

1[a] "a processor communicatively coupled to a non-transitory computer readable media containing program instructions executable to:"

Many capabilities of herd management software are virtually impossible to achieve utilising traditional paper-based techniques. For example, utilising such an application allows a farmer to easily view, analyse, manipulate and sort data, all in a matter of keystrokes. Such an activity would be extremely time consuming at the least, if not completely impossible for farmers to complete via traditional, paper-based techniques. Subsequently, farmers are able to easily and immediately view information on individual cattle, view an entire cows history (calving date, artificial insemination dates, treatments etc.), produce reports on individual cows, selected cows or the herd as a whole etc. All this can be conducted without physically looking

Ex. 1005 (Trevarthen), 101

90. The POSA would have understood that Trevarthen's herd management "software" (*id.*, 100) means executable program instructions that are necessarily stored on computer-readable media and that necessarily runs on a processor. Trevarthen explains that the operator may interface with the software

Ex. 1003, ¶ 90

Pet., 12

Trevarthen's System Retrieves RFID Information from RFID Devices

1[b] "retrieve animal identification information from an RFID device"

6.2.3. Fixed RFID Reader

In order to derive any use and subsequent benefit from the practice of identifying every cow with RFID tags, a farm requires an RFID reader device. Subsequently, at every position in which a farmer wishes to utilise a cows RFID number on a regular basis, a fixed RFID reader should be utilised. These provide a reliable and robust source of identification, while also providing a greater range for reading RFID devices than portable RFID readers.

Ex. 1005 (Trevarthen), 102

milked. At a minimum, placing the RFID reader in this position allows data to be automatically recorded regarding the time and date that each cow enters the milking parlour, and should at least be arranged so as to display cow information (displayed via relevant interface of the herd management software) on a computer screen at the end of the dairy. Placing the reader in this position also provides the possibility for the

Ex. 1005 (Trevarthen), 103

Pet., 13

Trevarthen's System Retrieves Sensed Animal Temperature

1[c] "retrieve sensed animal information from said RFID device, said sensed animal information generated by a sensor coupled to said RFID device"

6.3.8.2. Using the temperature sensing device

At a basic level, a temperature sensing RFID device could be read by fixed RFID readers at the entry to the dairy. Such an arrangement would ensure that each cow has their temperature read at a regular interval at least twice a day, thus providing valuable information to the farmer. At a more advanced level, it is proposed that RFID readers also be placed at other high congregation areas throughout the farm. For example, placing a high powered RFID reader near a water trough in a paddock, hay feeders or similar areas that are frequented by cows. Under this approach, more temperature readings can be gained between milkings, thus providing an enhanced ability to detect temperature variations, and also to view patterns of temperature change among the cows (e.g. middle of the day they may be warmer than at sunrise).

Ex. 1005 (Trevarthen), 122

Pet., 13-15

Trevarthen's System Matches Temperature With Milk Production

1[d] "match said sensed animal information retrieved from said RFID device to animal information of said animal stored in a database including an amount of milk production or a number of days in milk"

6.3.5.1. Operation

Milk meters are placed in the milk flow line leading from each set of milking cups to the main milk flow line (leading to the vat). From here, the meter can gauge the amount of milk flowing through the pipes from each cow. To be useful, this information should be automatically recorded in the herd management database, and associated with the cow currently registered by the software as being present in that particular bail number. Other pieces of information, such as the time at which the reading took place, the cows bail number, and duration of milking can also be derived from milk meters, and should be stored in the database. These pieces of information serve as solid records of each cow's milking session, and may provide grounds to various analysis activities for the farmer.

Ex. 1005 (Trevarthen), 112

100. Therefore, the POSA would have recognized from Trevarthen that both milk production information and temperature information are stored and associated with each cow's unique identification information in the database.

Ex. 1003 (Brown-Brandl Decl.), ¶ 100

Pet., 15-16

It Would Have Been Obvious to Use Temperature and Milk Production Together to Detect Illness

1[e] "enter said sensed animal information retrieved from said RFID device and said animal information stored in said database as logical variables into at least one logical expression; and"

1[f] "solve said at least one logical expression to obtain a corresponding at least one logical value"

6.3.5.5. Illness Detection

Utilising milk meters will also aid to identify any problems that may arise in the herd (such as illness). For example, if a cow provides a significantly lower amount of milk than their usual output, the system will be able to identify this disparity and alert the operators to check this cow when milking has completed. In this way, any illnesses or problems occurring with cows can be identified quickly and easily, subsequently enabling rapid treatment. The quicker that such issues are identified and treated, the

Ex. 1005 (Trevarthen), 115

6.3.8.1. The Value of Temperature Monitoring

The temperature of a cow is certainly a valuable attribute for a farmer to utilise in managing their herd. Importantly, fluctuations in the body temperature of a cow can indicate that the cow may be falling ill. Thus, reading this temperature will allow a more rapid response to aid in detection and subsequent treatment of any illnesses that a cow may have attracted. It will also enable the farmer to take action to minimise the

Ex. 1005 (Trevarthen), 121

Pet., 16-22; Reply, 6-11

It Would Have Been Obvious to Use Temperature and Milk Production Together to Detect Illness

1[e] "enter said sensed animal information retrieved from said RFID device and said animal information stored in said database as logical variables into at least one logical expression; and"

1[f] "solve said at least one logical expression to obtain a corresponding at least one logical value"

information, such as temperature information. A POSA, however, would have been motivated to input both sensed temperature information and stored milk production information as logical variables into the same logical expression to enhance the ability to detect whether cows were ill as part of an enhanced disease detection capability. Applying the techniques described in the art, the POSA would have reasonably expected to have been able to successfully implement such models and algorithms in Trevarthen's system.

Ex. 1003 (Brown-Brandl Decl.), ¶ 111

116. By considering ***both*** temperature and milk production in a logical expression, however, the farm would be able to detect sick animals more reliably.

Ex. 1003 (Brown-Brandl Decl.), ¶ 116

Pet., 16-22; Reply, 6-11

All Five Arguments Patent Owners Raises Against Ground 1 Fail

Obviousness of Claims 1-4 and 6 Based on Trevarthen

Issue 1: Trevarthen was publicly available

Issue 2: Trevarthen renders obvious combining "milk production" and "sensed information" (*e.g.*, temperature)

Issue 3: Trevarthen discloses the "program instructions" limitations

Issue 4: Trevarthen discloses the limitations of dependent claim 4

Issue 5: Trevarthen discloses the limitations of dependent claim 6

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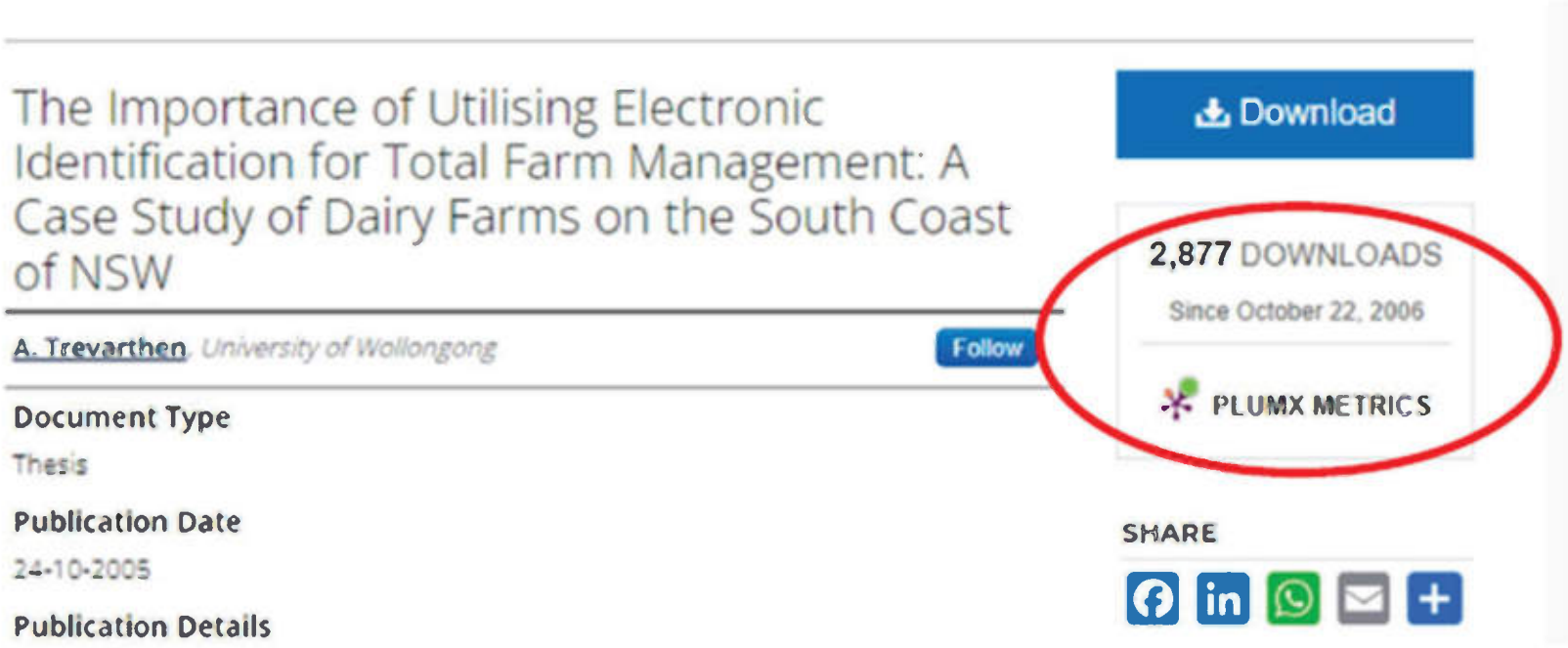
There Is No Dispute Trevarthen Was on the University of Wollongong's Research Online by October 22, 2006



Ex. 1031 (Munford Decl.), ¶ 20

Research Online Sought to Publicly Disseminate Articles

RESEARCH ONLINE

Research Online (RO) utilises **Digital Commons** to highlight and promote University of Wollongong scholarship and research output of various types, including refereed journal articles and conference papers. Information on the use of *Research Online* is provided below.

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Research Online is an open access digital archive, or institutional repository, promoting the scholarly output of the University of Wollongong.

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Institutional Repositories (IR) bring together under one umbrella a University's published research output in electronic form. Aiming to preserve and provide access to that research, IRs are an excellent vehicle for storing journal articles, conference papers and other ouputs such as working papers and reports. The majority of institutional repositories are 'open access', meaning that the works held within them are freely accessible and can be located using internet search engines such as Google.

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Q Will my papers be found by Google?

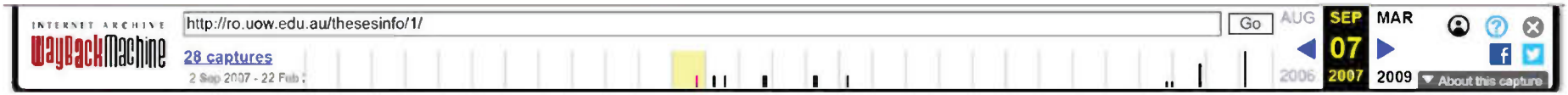
Yes. A paper loaded onto Research Online is usually available on Google the following day. Papers in OAI (Open Access Initiative) compliant repositories can be found by Google. Research Online is OAI compliant so records are easily retrievable via Google. In fact most hits on papers in the repository come via a Google search.

Ex. 1030 (Internet Archive Capture of Research Online), 6, 10

Trevarthen's Download Statistics Confirm Availability

TITLE:
The Importance of Utilising Electronic Identification for Total Farm Management: A Case Study of Dairy Farms on the South Coast of NSW

AUTHOR(S):
A. Trevarthen, *University of Wollongong*



This item has been downloaded 324 times.

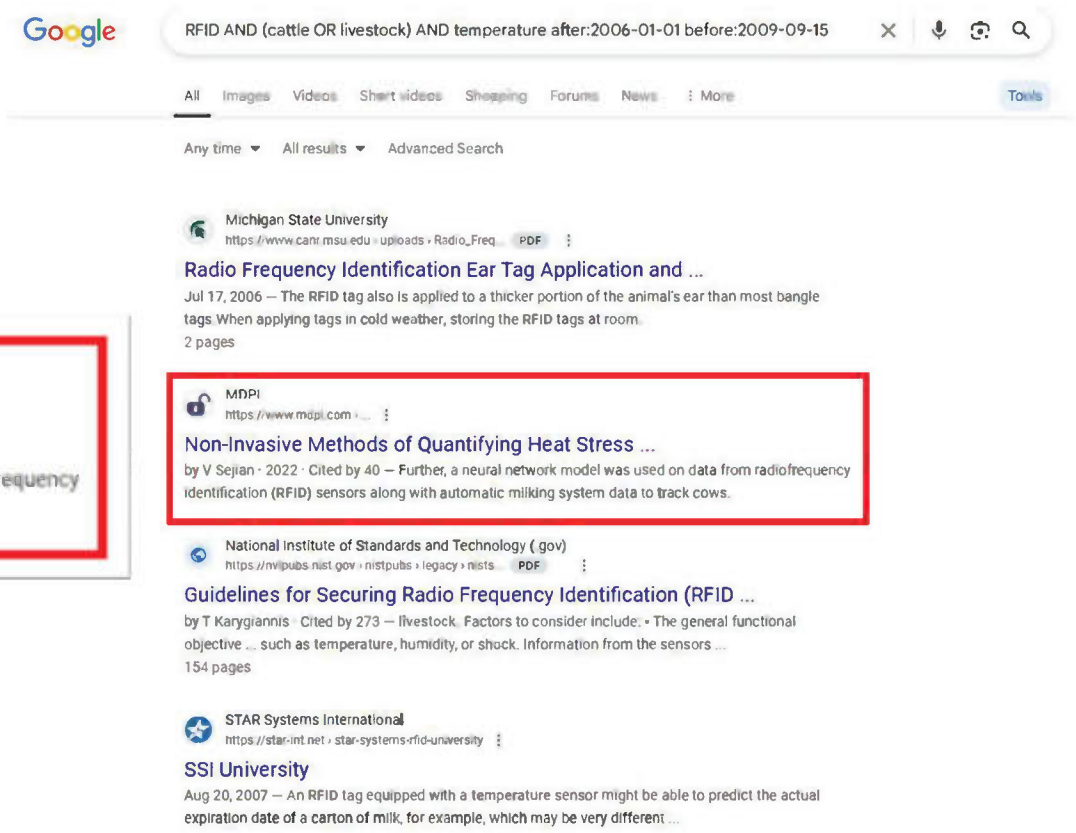
Ex. 1030 (Internet Archive Capture of Research Online), 13

This item has been downloaded 569 times.

Ex. 1030 (Internet Archive Capture of Research Online), 15

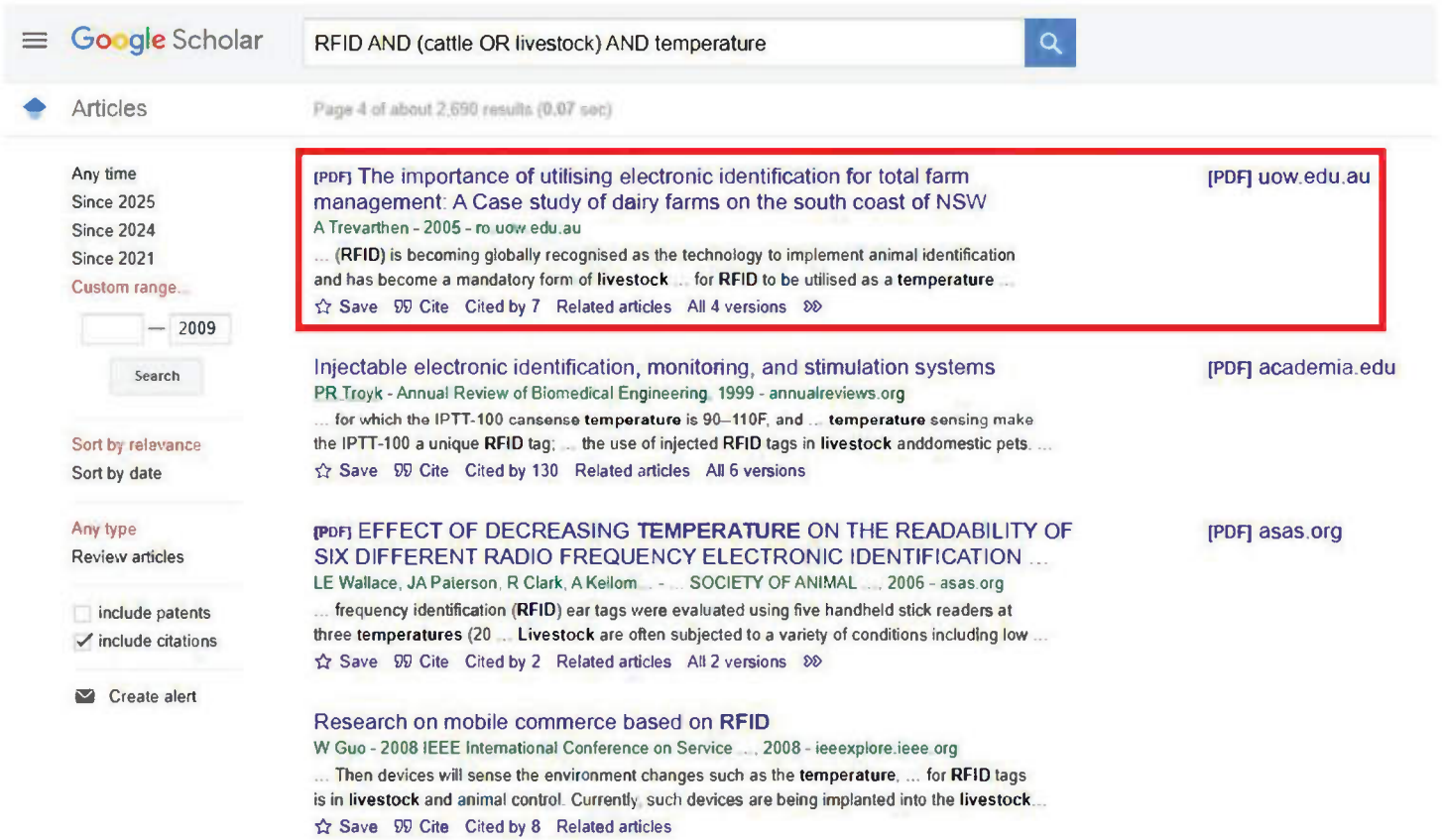
Pet., 8; Reply, 4

Patent Owner's Date Limited Time Searches Are Unreliable and Include Results Not in the Date-Limited Range



Ex. 1055 (Brown-Brandl Reply), ¶ 8-10; Reply, 2-3

It Is Unrebutted that Trevarthen Is Locatable on Google Scholar



Ex. 1055 (Brown-Brandl Reply), ¶ 13; *see also id.* ¶¶ 11-12

The International Search Report Confirms Trevarthen Was Locatable Through Internet Searching

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ2007/000286

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. ***A01K 15/04*** (2006.01) ***G07C 9/00*** (2006.01)

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)

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)
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

Ex. 1028, 1

Pet., 9; Reply, 5

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Trevarthen Discloses "Total Farm Management" Using an RFID System

In **Chapter 5**, Trevarthen describes existing RFID technology at the "Cochrane Dairy."

5.1. The Cochrane Dairy

5.1.1. The Advanced Case Study

This case study was undertaken on the Cochrane dairy farm, located in Pyree (minutes from Nowra) on the NSW South Coast. This farm has been selected as the advanced case study, as it has a strong use of RFID technology, and is well known in the region as one of the most advanced RFID setups. As the farm also utilises RFID tags that are

Ex. 1005 (Trevarthen), 69

In **Chapter 6**, Trevarthen proposes "enhancements" to the Cochrane Dairy for "Total Farm Management."

Chapter 6 – Towards Total Farm Management

6.1. The Current State

Chapters 5 and 6 have demonstrated the operation of a dairy farm without RFID, and also how RFID is currently being utilised at a relatively advanced level for farm management. From these case studies, it is possible to identify numerous common elements evident from both farms, and the assistance that RFID is currently providing to dairy farm management practices. This chapter will attempt to build upon the current RFID usage as identified in the case studies, proposing a framework for the use of RFID on dairy farms, while also proposing enhancements and ideas which could be considered as future additions to further add value to the utilisation of RFID in farm management.

Ex. 1005 (Trevarthen), 99

Pet., 9-10; Reply, 6-8

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Trevarthen's "Total Farm Management" System Relies on Both Temperature and Milk Production to Determine Illness

6.3.8.1. The Value of Temperature Monitoring

The temperature of a cow is certainly a valuable attribute for a farmer to utilise in managing their herd. Importantly, fluctuations in the body temperature of a cow can indicate that the cow may be falling ill. Thus, reading this temperature will allow a more rapid response to aid in detection and subsequent treatment of any illnesses that a cow may have attracted. It will also enable the farmer to take action to minimise the

Ex. 1005 (Trevarthen), 121

6.3.5.5. Illness Detection

Utilising milk meters will also aid to identify any problems that may arise in the herd (such as illness). For example, if a cow provides a significantly lower amount of milk than their usual output, the system will be able to identify this disparity and alert the operators to check this cow when milking has completed. In this way, any illnesses or problems occurring with cows can be identified quickly and easily, subsequently enabling rapid treatment. The quicker that such issues are identified and treated, the

Ex. 1005 (Trevarthen), 115

Pet., 16-22; Reply, 6-11

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Patent Owner's Expert Admitted That It Was Known to Rely on More Than One Variable to Determine Illness

Q. So, this leads to another question I have. So, it sounds like there -- there are several variables you have to consider when you're examining an animal to determine their health status. Is that reasonable?

A. Yeah. I mean, that's very, like, unspecified, "several variables," but there -- there's -- there's -- for sure, there's more than one variable.

Ex. 1037 (Bowser Dep.), 70:2-9

Patent Owner does not address its expert's testimony in Sur-Reply.

See also Ex. 1037, 97:19-98:5, 99:2-8, 111:15-23; Reply, 8-11

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Patent Owner's Arguments Are Incorrect

Patent Owner presents four arguments why a POSITA would not have relied on both temperature and milk production to determine illness:

1. Temperature sensing devices were not suitable for livestock or commercially available

2. A POSITA would not have known that relying on multiple parameters generates a more reliable indication of illness

3. de Mol warns against false positives using both temperature and milk production

4. Relying on two variables would have resulted in "overfitting"

All four arguments are wrong.

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Temperature Sensing RFID Devices Were Available

- Trevarthen discloses that "RFID temperature sensing is a currently available technology."

such, details of such devices have not been included in this framework. On the other hand, RFID temperature sensing is a currently available technology, and its use in the livestock industry is currently being investigated.

Ex. 1005 (Trevarthen), 123

6.3.8. Temperature monitoring within RFID

It is evident from the articles of Higgins (2003) and Hostetter (2003) (articles described in section 2.7), that it is possible to incorporate temperature sensing abilities into RFID microchips currently – the application of which may soon be extended to the livestock industry. Such a device will provide the temperature of the cow along with the cows unique identification number every time the tag is read by an RFID reader.

Ex. 1005 (Trevarthen), 121

Pet., 11, 14; Reply, 11-12

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It Was Well Known Prior to Trevarthen That Relying on Multiple Parameters Generates a More Reliable Indication of Illness

According to the invention, a more reliable indication signal of heat or illness is obtainable from parameters including one or more of the following: the milk rate of flow, the temperature of a milk flow, the milk yield, and/or the number of times per given time period that an animal pays a visit to the milking parlor or the food quantity consumed in the milking parlor. These parameters for ill or estrous

Ex. 1023 (van den Berg), 4:13-18

6. Detection method

The detection model is meant to draw the attention of the farmer to possible deviations in his cows; the model should generate alerts for that purpose. Alerts can be generated based on yield, temperature, conductivity and activity with the time series models for these variables. With the help of the time series models together

temperature falls outside a certain confidence interval. An illness alert is based on the sum of standardised errors of yield, temperature, activity and concentrates intake.

Ex. 1033 (de Mol), 180-181

Pet., 20-21; Reply, 8-10

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Patent Owner Incorrectly Argues the de Mol's Methods Are "Unusable" in View of False Positives

The described model has been implemented and tested on two experimental farms (of IMAG-DLO and ID-DLO). Cases of oestrus or disease that were signalled by the model are true positive (TP), not signalled cases are false negative (FN). Milkings outside an oestrus or illness period are true negative (TN) if there is no alert from the model, otherwise they are false positive (FP). The model performance was expressed in the sensitivity and the specificity.

Some results are given in Tables 2–4; more results can be found in De Mol et al. (1997). The results depend on the chosen confidence interval. Tightening the criterion leads to a lower sensitivity and higher specificity, and vice versa. Results for oestrus are satisfying, as well as the sensitivity for mastitis. The number of false positives (as implied by the specificity) may be too high for practical implementation. The results for diseases are promising but further research is needed.

Ex. 1033 (de Mol), 182

Acorda Therapeutics, Inc. v. Roxane Lab'ys, Inc., 903 F.3d 1310, 1333 (Fed. Cir. 2018) ("This court has long rejected a requirement of '[c]onclusive proof of efficacy' for obviousness.").

Pet., 20-21; Reply, 10-11

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Relying on Temperature and Milk Production Is Not "Overfitting"

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

Ex. 1055 (Brown-Brandl Reply), ¶ 20 (citing Exs. 1039-1042)

There is no evidence that relying on just two variables (temperature and milk production) results in "overfitting."

See Sur-Reply, 9-10

Claim 1 Recites "Program Instructions" to Execute Steps

1. A computer implemented animal management system, comprising:

a processor communicatively coupled to a non-transitory computer readable media containing program instructions executable to:

[1] retrieve animal identification information from an RFID device;

[2] retrieve sensed animal information from said RFID device, said sensed animal information generated by a sensor coupled to said RFID device;

[3] match said sensed animal information retrieved from said RFID device to animal information of said animal stored in a database including an amount of milk production or a number of days in milk;

[4] enter said sensed animal information retrieved from said RFID device and said animal information stored in said database as logical variables into at least one logical expression; and

[5] solve said at least one logical expression to obtain a corresponding at least one logical value.

Ex. 1001 ('206 Patent), Claim 1

Trevarthen Discloses Farm Management Software—*i.e.*, "Program Instructions"

- Trevarthen's farm management software includes "program instructions," which, when executed, perform the steps.

Many capabilities of herd management software are virtually impossible to achieve utilising traditional paper-based techniques. For example, utilising such an application allows a farmer to easily view, analyse, manipulate and sort data, all in a matter of keystrokes. Such an activity would be extremely time consuming at the least, if not completely impossible for farmers to complete via traditional, paper-based techniques. Subsequently, farmers are able to easily and immediately view information on individual cattle, view an entire cows history (calving date, artificial insemination dates, treatments etc.), produce reports on individual cows, selected cows or the herd as a whole etc. All this can be conducted without physically looking

Ex. 1005 (Trevarthen), 101

90. The POSA would have understood that Trevarthen's herd management "software" (*id.*, 100) means executable program instructions that are necessarily stored on computer-readable media and that necessarily runs on a processor. Trevarthen explains that the operator may interface with the software

Ex. 1003, ¶ 90

Pet., 12; Reply, 12-13

Trevarthen Discloses the Limitations of Dependent Claim 4

4. The system of claim 1, wherein said sensed animal information comprises sensed physiological information of said animal, and wherein said animal information stored in said database comprises health information associated with said animal, and wherein said logical value indicates an occurrence of an illness of said animal.

133. In addition to storing temperature and milk production information (*supra* §§VIII.A.4-VIII.A.5) that are indicators of animal health, Trevarthen also describes using its herd management software and database to store and to view cow health information such as "treatments." Trevarthen, 101. Using the system "farmers are able to easily and immediately view information on individual cattle, view an entire cow[']s history (calving date, artificial insemination dates, treatments etc.), produce reports on individual cows, selected cows or the herd as a whole etc." *Id.*

Ex. 1003 (Brown-Brandl Decl.), ¶ 133

Many capabilities of herd management software are virtually impossible to achieve utilising traditional paper-based techniques. For example, utilising such an application allows a farmer to easily view, analyse, manipulate and sort data, all in a matter of keystrokes. Such an activity would be extremely time consuming at the least, if not completely impossible for farmers to complete via traditional, paper-based techniques. Subsequently, farmers are able to easily and immediately view information on individual cattle, view an entire cows history (calving date, artificial insemination dates, treatments etc.), produce reports on individual cows, selected cows or the herd as a whole etc. All this can be conducted without physically looking

Ex. 1005 (Trevarthen), 101

Pet., 25; Reply, 13-15

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Trevarthen Discloses Two Forms of "Health Information"

- **Milk production information** is "health information"

United States Patent [19]
van den Berg et al.

[11] **Patent Number:** **5,568,788**
[45] **Date of Patent:** **Oct. 29, 1996**

According to the invention, a more reliable indication signal of heat or illness is obtainable from parameters including one or more of the following: the milk rate of flow, the temperature of a milk flow, the milk yield, and/or the number of times per given time period that an animal pays a visit to the milking parlor or the food quantity consumed in the milking parlor. These parameters for ill or estrous animals are different from those for healthy and non-estrous animals. One or more of the parameters may be combined

Ex. 1023 (van den Berg), 4:12-21

- **Treatment history** is "health information"

(19) **United States**
(12) **Patent Application Publication**
Lee et al.

(10) **Pub. No.: US 2003/0121972 A1**
(43) **Pub. Date:** **Jul. 3, 2003**

[0091] Here, the health information read in the hospital system **10** is information on emergency, vaccination, medical history, emergency records, medical treatment, prescription, examination and medication. These data is written in the patient cards via the card reader **30 (S420)**.

Ex. 1043 (Lee), ¶ 91

Pet., 25; Reply, 13-15

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Trevarthen Renders Obvious Dependent Claim 6

6. The system of claim 4, wherein said animal identification information further comprises said animal identification information correspondingly generated by a plurality of RFID devices implanted in a plurality of animals, wherein said sensed animal information comprises said sensed animal information generated by said plurality of RFID devices implanted in said plurality of animals, wherein said at least one logical expression solves as to a selected period of time as to said plurality of animals correspondingly associated with said animal identification information if a greater than selected number of said illness have occurred.

143. Because Trevarthen's system records the data for each identified cow in its database (*supra* §VIII.A.3 (element 1[B])), the database software would be configurable to tabulate the total number of illnesses within the herd through an arithmetical expression. For example, the database could record each incidence of illness determined by solving the logical expression of claim 1 (*supra* VIII.A.6-VIII.A.7), and the operator could set a threshold value, which, when exceeded, would broadcast an alert to the operator.

Ex. 1003 (Brown-Brandl Decl.), ¶ 143

Pet., 26-28; Reply, 15-17

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Trevarthen Discloses Solving an Expression as to a "Selected Period of Time as to Said Plurality of Animals"

6.3.8.2. Using the temperature sensing device

At a basic level, a temperature sensing RFID device could be read by fixed RFID readers at the entry to the dairy. Such an arrangement would ensure that each cow has their temperature read at a regular interval at least twice a day, thus providing valuable information to the farmer. At a more advanced level, it is proposed that RFID readers also be placed at other high congregation areas throughout the farm. For example, placing a high powered RFID reader near a water trough in a paddock, hay feeders or similar areas that are frequented by cows. Under this approach, more temperature readings can be gained between milkings, thus providing an enhanced ability to detect temperature variations, and also to view patterns of temperature change among the cows (e.g. middle of the day they may be warmer than at sunrise). The obvious flaw in this system however, is that the temperature readings are not gained at the same time for the herd (thus making them somewhat incomparable), and it cannot be guaranteed that each cow will be read at any more frequent intervals than at the entrance to the dairy.

Ex. 1005 (Trevarthen), 122

Pet., 26-28; Reply, 15-17

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Trevarthen Renders Obvious Calculating "if a Greater Than Selected Number of Said Illness Have Occurred"

- One of the objectives of Trevarthen is to improve the use of RFID technology in farms to detect and prevent disease outbreak

1.1. Introduction

Radio Frequency Identification (RFID) is becoming globally recognised as the technology to implement animal identification, and has become a mandatory form of livestock management in many countries (such as Canada, and some states of Australia), while other countries have begun trials of the technology (such as the United States of America). In the current global livestock environment, awareness, fear and recognition of animal borne diseases such as 'mad cow disease' have driven calls for reliable and effective systems for individual identification and tracking of livestock throughout the animals' entire lifecycle. Such systems empower authorities with rapid and precise information (such as the animals' farm of origin, cows it has been in contact with etc.), aiding them to take prompt and direct action to reduce the possibility of a disease outbreak. Considering this global trend towards the use of RFID for individual whole-of-life animal tracking, it appears that farmers will soon be utilising this technology, whether by choice or to meet a mandatory/obligatory requirement. As such, it is important that research be undertaken to identify how the electronic identification technology of RFID may be utilised to enhance total farm management, derive additional benefits and maximise return on investment for the farmer. The following thesis has been undertaken to address this need, specifically focussing upon RFID usage within dairy farms.

Ex. 1005 (Trevarthen), 1

There is currently a worldwide trend towards improving traceability systems within livestock industries, and RFID is the primary technology of choice. Spurred by disease incidents from around the world, such as the Bovine Spongiform Encephalopathy (BSE, more commonly known as 'mad cow disease') outbreaks in the late 1990's, countries such as those within the European Union (EU) have enacted policies to ensure livestock can be traced through their entire lifecycle (Animal Health Australia n.d.). Programs such as these are designed to minimise or eliminate the spread of disease as authorities are able to trace origins of diseases, identifying farms and animals that may have been affected and subsequently they are able to take direct appropriate action to minimise further spread (Food Production Daily 2004). Other

Ex. 1005 (Trevarthen), 3

Pet., 26-28; Reply, 15-17

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Trevarthen Renders Obvious Calculating "If a Greater Than Selected Number of Said Illness Have Occurred"

- To satisfy Trevarthen's objective, it would have been obvious to issue an alert when a threshold number of illnesses is reached

142. In order to identify operators to potential disease outbreaks, one of Trevarthen's express objectives, the POSA would have been motivated to configure Trevarthen's herd management system to solve the logical expression and issue an alert when a threshold number of illnesses (i.e., a selected number of illnesses) is met or exceeded. For example, a single incidence of an infection may

Ex. 1003 (Brown-Brandl Decl.), ¶ 142

144. Configuring Trevarthen's system to add this additional threshold based on the number of ill animals, is merely combining prior-art elements according to known methods to yield predictable results. Moreover, the inclusion of this additional tracking feature would potentially improve the ability of the Trevarthen system to detect disease outbreaks in a predictable manner.

Ex. 1003 (Brown-Brandl Decl.), ¶ 144

Pet., 26-28; Reply, 15-17

Patent Owner's Argument on Ground 2 Is Wrong

Obviousness of Claims 17-20 Based on Trevarthen and Brune

Issue 1: Trevarthen + Brune renders obvious "retriev[ing] date-time information ***from said RFID device***"

Date-time stamping at the RFID reader (Trevarthen)

These fixed readers can be used in conjunction with other devices to enable a subsequent action or series of actions to be performed, or decisions to be automatically made (based on set data parameters). For example, fixed readers may be utilised for the purposes of identifying a cow as she enters the milking parlour, and subsequently recording the time and date of this read to the central herd management database (indicating the milking time for this cow). Likewise, fixed RFID readers may

Ex. 1005 (Trevarthen), 102

Date-time stamping at the RFID device (Brune)

At block **10**, the remote receiver receives a message in the form of an air-borne signal which is transmitted from a bolus implanted within the stomach of a cow. The message or signal is preferably in the form of a data packet represented by a number of data pulses. For each message, the data packet includes temperature data representing the sensed temperature within the stomach, identification data such as an identification number which is unique to the specific cow, and date and/or time stamp data corresponding to the discrete point in time at which the temperature was sensed by the bolus. In the embodiment shown, each data packet corresponds to a single sensed temperature within the stomach; however, it is also possible for a data packet to include data corresponding to multiple sensed temperatures and associated discrete times of sensing. At block 12, the mes-

Ex. 1008 (Brune), 4:1-11

Pet., 29-33; Reply, 18-20

It Would Have Been Obvious to Date-Time Stamp at the RFID Device

retrieved from the RFID device. Additionally, Trevarthen discloses identifying "fluctuations" and "anomalies" in temperature. *Id*.,121-22. A POSA would therefore have understood that a time-series of time-date stamped temperature measurements are needed to identify fluctuations and anomalies.

Ex. 1003 (Brown-Brandl Decl.), ¶ 150

device itself. Regardless, the POSA would have found it obvious to have the RFID device itself provide such date-time information as an alternative embodiment. The date-time information stored in the central herd management database indicating when the cow enters the milking parlour (*id.*, 102-103) would be the same regardless of whether the date-time stamp is applied by the reader or retrieved from the RFID device.

Ex. 1003 (Brown-Brandl Decl.), ¶ 151

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.

Ex. 1055 (Brown-Brandl Reply), ¶ 24

Pet., 29-33; Reply, 18-20

There Are No Drawbacks to Date-Time Stamping at RFID Device

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.

Ex. 1055 (Brown-Brandl Reply), ¶ 25

Pet., 29-33; Reply, 18-20

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’206 Patent: Grounds 3 & 4

Ground 3: Laitinen, Buchanan, and Liao Render Obvious Claims 1-4 and 6

Ground 4: Laitinen + Brune Renders Obvious Claims 17-20

02

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Laitinen Discloses an Animal Surveillance System

1[pre] "A computer implemented animal management system, comprising"

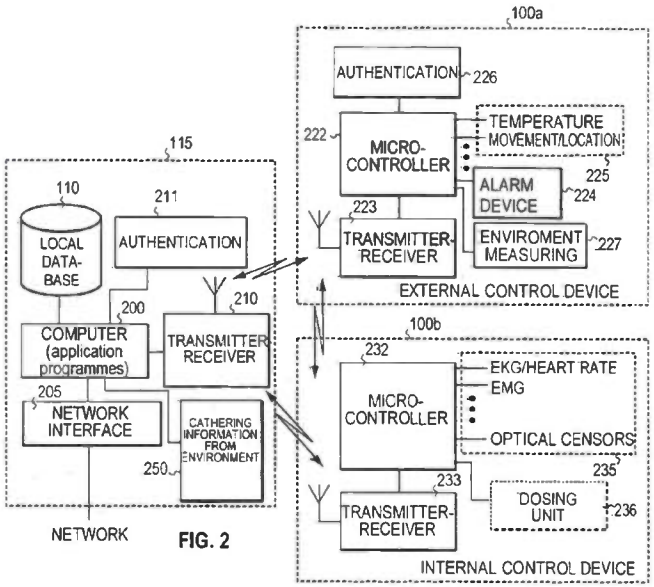

FIG. 2

Ex. 1006 (Laitinen), Fig. 2

(12) **United States Patent**
Laitinen et al.

(10) **Patent No.: US 7,059,275 B2**
(45) **Date of Patent: Jun. 13, 2006**

(54) **SURVEILLANCE SYSTEM FOR ANIMALS**

(75) Inventors: **Arvo Laitinen**, Nurmijarvi (FI); **Tarmo Lankinen**, Latva (FI); **Tiina Varho-Lankinen**, Latva (FI); **Hannu Saloniemi**, Helsinki (FI); **Jarkko Tuomi**, Espoo (FI); **Jarkko Vuori**, Helsinki (FI)

5,189,395	A *	2/1993	Mitchell	340/539.11
5,315,505	A *	5/1994	Pratt et al.	600/300
5,322,034	A *	6/1994	Willham et al.	340/10.41
5,568,119	A *	10/1996	Schipper et al.	340/825.37
5,673,647	A *	10/1997	Pratt	119/51.02
5,791,294	A *	8/1998	Manning	119/721
5,803,906	A *	9/1998	Pratt et al.	600/300

A system for the surveillance of animals includes identification and measuring elements attached to the animals, as well as at least one local level information system (115), wirelessly connected to the identification and measuring elements of a certain group of animals for saving animal-specific measuring results into the information network. Aiming to provide a new kind of a surveillance system for domestic husbandry that enables different interest groups to monitor the kind of a group of animals they wish, the system includes at least one higher level information system, connected to the chosen local level system through a communications network for the reception of animal-specific measuring results from at the minimum one local system, and at least one software application using the data gathered in the higher level system to produce information about the animals to at the minimum one higher level information system by processing the collected data.

Ex. 1006 (Laitinen), Cover, Abstract

Pet., 37, 41-42

Laitinen's Surveillance System Uses a Processor

1[a] "a processor communicatively coupled to a non-transitory computer readable media containing program instructions executable to:"

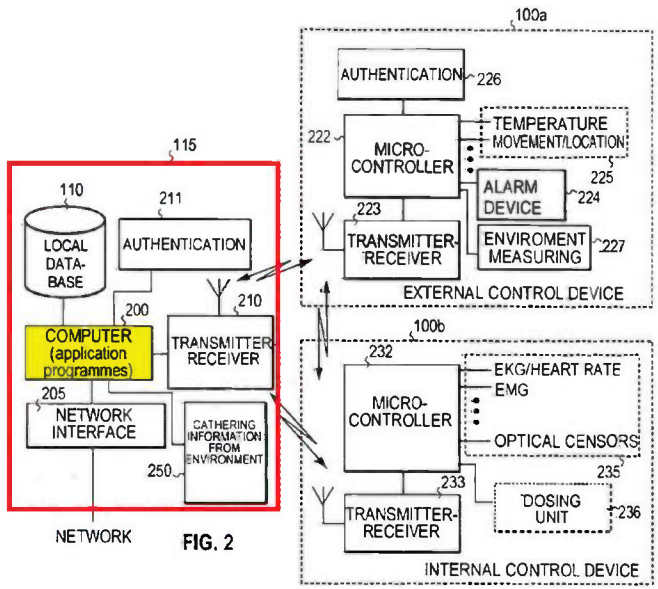

FIG. 2

Ex. 1006 (Laitinen), Fig. 2

The middle, that is to say, local level consists in practice of one or more local **115** information systems, located in the farm of one farmer or breeder and tailored to meet its requirements by modifying a normal personal computer, for instance. At the very minimum, a local information system comprises a **105** terminal unit, typically featuring the **110** data base into which the terminal gathers local measuring and surveillance and other important information. Gathering, assessing and presenting data concerning the animals' health, the production environment and the farm are the functions of the local system. The terminal unit compiles

Ex. 1006 (Laitinen), 4:5-15

Pet., 42-43

Laitinen's System Retrieves Identification Information from RFID Devices

1[b] "retrieve animal identification information from an RFID device"

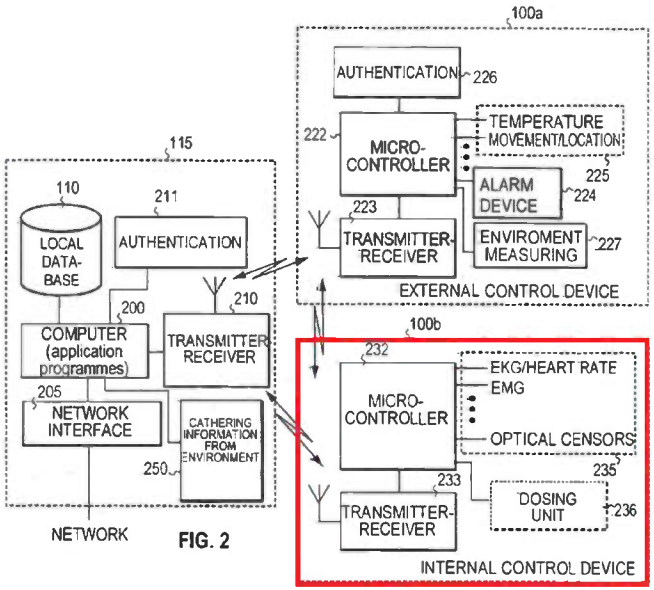

FIG. 2

Ex. 1006 (Laitinen), Fig. 2

Censor unit connected to the micro controller for the surveillance of the animal's body temperature, occlusion, muscular action, motion or metabolic level. The censor 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 (Laitinen), 3:51-57

ing of the animal's medication. Each surveillance device includes a personalized identifier for the correct identification of the animal in question.

Ex. 1006 (Laitinen), 6:2-4

Pet., 43

Laitinen's System Retrieves Sensed Animal Temperature

1[c] "retrieve sensed animal information from said RFID device, said sensed animal information generated by a sensor coupled to said RFID device"

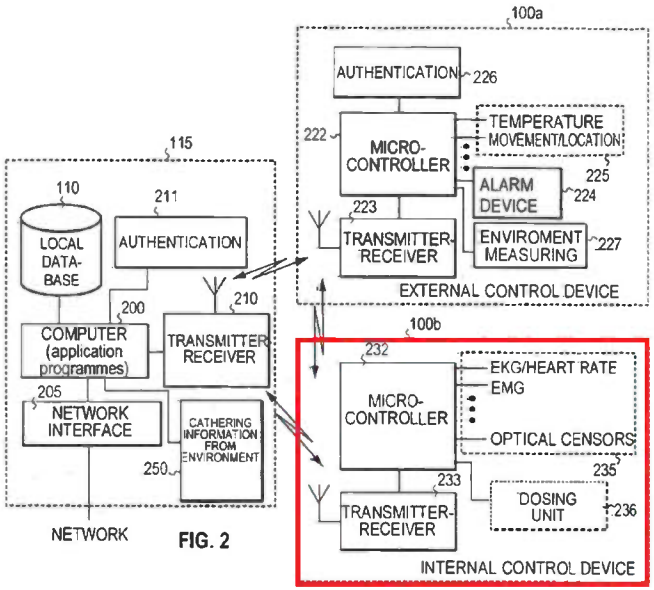

FIG. 2

Ex. 1006 (Laitinen), Fig. 2

Censor unit connected to the micro controller for the surveillance of the animal's body temperature, occlusion, muscular action, motion or metabolic level. The censor 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 (Laitinen), 3:51-57

Pet., 44

Buchanan and Liao Each Disclose Storing Milk Production Information

1[d] "match said sensed animal information retrieved from said RFID device to animal information of said animal stored in a database including an amount of milk production or a number of days in milk"

Buchanan:

Cup sensors or milk meters are becoming available for generating quantitative an qualitative data for milking of individual animals. For example units are available which determine somatic cell count and/or milk volume for an individual animal milking session. The equipment typically includes, either sensors mounted in the milking claw, or a sensor that is mounted in the milk line between the claw and the main milk line of the cow shed.

Ex. 1011 (Buchanan), 19:17-31

Liao:

According to yet another embodiment of the invention, the proposed dairy farm decision relates to whether one or more animals should be subjected to mastitis testing. To this aim, the dairy farm data D includes a first input parameter reflecting an animal identity, and for each identity, parameters indicating one or more of the following: a status of a low-activity alarm (i.e. essentially whether a Registered activity level falls below a threshold level, which may depend on the animal's present movement space), a milk conductivity, a relative milk yield, a somatic cell count (SCC) and a number of days in milk. Preferably, the output

Ex. 1010 (Liao), 15:16-29

Pet., 44-47

It Would Have Been Obvious to Use Temperature and Milk Production Together to Make Insemination Decisions

1[e] "enter said sensed animal information retrieved from said RFID device and said animal information stored in said database as logical variables into at least one logical expression; and"

1[f] "solve said at least one logical expression to obtain a corresponding at least one logical value"

Laitinen uses *multiple variables*, including body temperature, to determine if a cow is in heat:

> underlined numbers. To monitor the animal's heat with a pico level device, body temperature and movement are usually measured. The obtained information is received by

Ex. 1006 (Laitinen), 8:9-11

Liao uses *multiple variables*, including milk production and days in milk, to make insemination decisions:

> Continuing with the insemination example, the system may produce the following table in response to a farmer's/user's inquiry regarding which animals in his/her herd of livestock that should be inseminated today.

Animal ID	DIM	Peak Yield	Av.# Ins./ conception.	Heat	Last Heat	Lactation	BCS
1234	70	50	2,0	Yes	—	1	3,0
2345	60	40	1,5	Yes	21	3	3,5
3456	120	60	3,0	Yes	23	1	2,0

Ex. 1010 (Liao), 12:3-15

Pet., 47-52; Reply, 20-23

It Would Have Been Obvious to Use Temperature and Milk Production Together to Detect Illness

1[e] "enter said sensed animal information retrieved from said RFID device and said animal information stored in said database as logical variables into at least one logical expression; and"

1[f] "solve said at least one logical expression to obtain a corresponding at least one logical value"

187. The POSA would also have been aware that lowered milk production was also an indicator of illness, or related conditions such as heat stress. Liao, 6:32-7:6 (milk yield and days in milk parameters for determining whether animal should be tested for mastitis); Ex. 1023, 4:12-18 (milk yield as a reliable indicator of illness); Brune, 6:48-50 ("heat stress may cause the milk production of a dairy cow to decrease for several days."). Therefore, the POSA would have been motivated to modify the second logical expression of Laitinen to include milk yield as an input, along with temperature. Indeed, it was well known for decades that a combination of variables was likely to improve reliability of a logical expression that determined whether a cow is ill and advising on medical treatments. *Supra* §V.C.

188. By combining temperature and milk production as input variables to a logical expression, the POSA would have understood that dairies would have more effectively been able to determine whether temperature and milk production anomalies are indicators of illness or cause by some other issue. Indeed, the art had been focused for decades on improving illness diagnosis through combining variables using different models and algorithms. *Supra* §V.C. For example, a

Ex. 1003 (Brown-Brandl Decl.), ¶ 187-188

Pet., 47-52; Reply, 20-23

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All Four Arguments Patent Owner Raises Against Ground 3 Fail

Obviousness of Claims 1-4 and 6 Based on Laitinen, Buchanan, and Liao

Issue 1: A POSITA would have used a logical expression with both temperature and milk production

Issue 2: Laitinen discloses the "program instructions" limitations

Issue 3: Laitinen discloses or renders obvious an implanted temperature-sensing RFID device (claims 2, 3, and 6)

Issue 4: Laitinen discloses the limitations of dependent claim 4

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Laitinen Discloses Logical Expressions That a POSITA Would Have Used With Temperature and Milk Production Information

The application of a system based on the invention in the processes of heat control and artificial insemination is described in the following: in FIG. **5** the functions between the different elements of the system are illustrated with underlined numbers. To monitor the animal's heat with a pico level device, body temperature and movement are usually measured. The obtained information is received by

Ex. 1006 (Laitinen), 8:5-15

An additional goal can be to find an inverse function $x=f^{-1}(y,z)$ with which the necessary medical treatment could be found by analysing the animal's present condition. A

Ex. 1006 (Laitinen), 7:35-37

Pet., 47-52; Reply, 20-23

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It Was Well Known Prior to Laitinen That Relying on Temperature and Milk Production Predicts Illness

According to the invention, a more reliable indication signal of heat or illness is obtainable from parameters including one or more of the following: the milk rate of flow, the temperature of a milk flow, the milk yield, and/or the number of times per given time period that an animal pays a visit to the milking parlor or the food quantity consumed in the milking parlor. These parameters for ill or estrous

Ex. 1023 (van den Berg), 4:13-18

6. Detection method

The detection model is meant to draw the attention of the farmer to possible deviations in his cows; the model should generate alerts for that purpose. Alerts can be generated based on yield, temperature, conductivity and activity with the time series models for these variables. With the help of the time series models together

temperature falls outside a certain confidence interval. An illness alert is based on the sum of standardised errors of yield, temperature, activity and concentrates intake.

Ex. 1033 (de Mol), 180-181

Pet., 47-52; Reply, 20-23

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It Would Have Been Obvious for a POSITA To Develop a Logical Expression

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.

Ex. 1055 (Brown-Brandl Reply), ¶ 32

Pet., 47-52; Reply, 20-23

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Laitinen Discloses a Computer with Software

- Laitinen's system includes "software" ("application programmes"), which, when executed, perform the steps.

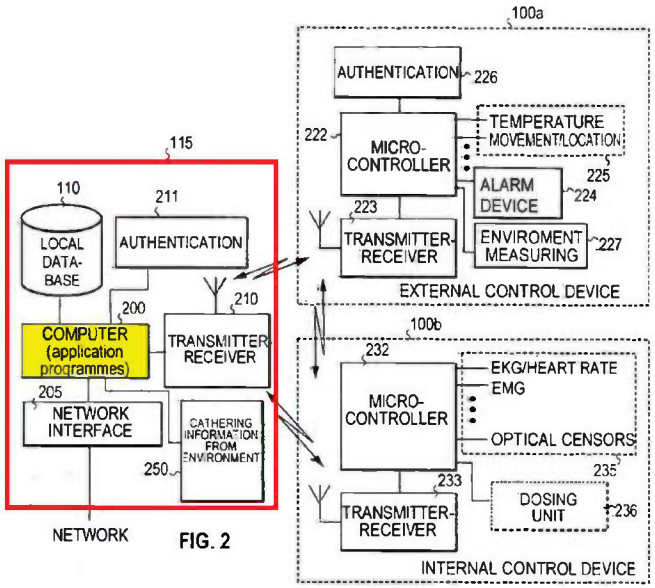

FIG. 2

Ex. 1006 (Laitinen), Fig. 2

The middle, that is to say, local level consists in practice of one or more local **115** information systems, located in the farm of one farmer or breeder and tailored to meet its requirements by modifying a normal personal computer, for instance. At the very minimum, a local information system comprises a **105** terminal unit, typically featuring the **110** data base into which the terminal gathers local measuring and surveillance and other important information. Gathering, assessing and presenting data concerning the animals' health, the production environment and the farm are the functions of the local system. The terminal unit compiles

Ex. 1006 (Laitinen), 4:5-15

Pet., 42-43; Reply, 25-26

Laitinen Discloses an Implantable Device That Measures and Transmits Temperature (Claims 2, 3, and 6)

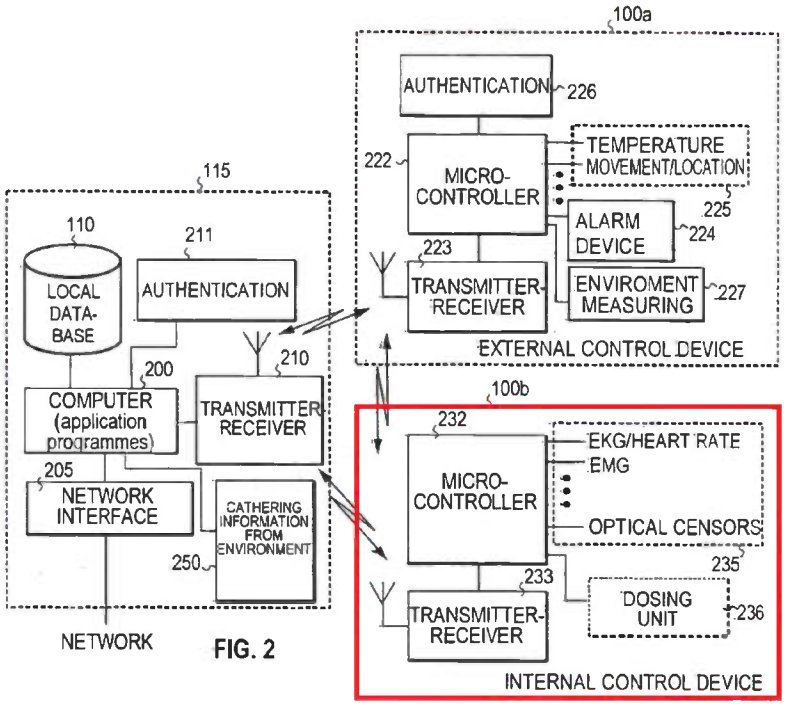

FIG. 2

Ex. 1006 (Laitinen), Fig. 2

Censor unit connected to the micro controller for the surveillance of the animal's body temperature, occlusion, muscular action, motion or metabolic level. The censor 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 (Laitinen), 3:51-57

FIG. 2 exemplifies two different pico level devices connected to a local information system. The pico level control device can be either external (**100***a*) or implanted inside the animal's tissue (**100***b*). The device comprises censors of the censor unit (**225** or **235**) connected to a micro controller (**222** or **232**).

Ex. 1006 (Laitinen), 5:38-43

Pet., 52-53; Reply, 23-25

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Laitinen Discloses Health Information (Claim 4)

4. The system of claim 1, wherein said sensed animal information comprises sensed physiological information of said animal, and wherein said animal information stored in said database comprises health information associated with said animal, and wherein said logical value indicates an occurrence of an illness of said animal.

and surveillance and other important information. Gathering, assessing and presenting data concerning the animals' health, the production environment and the farm are the functions of the local system. The terminal unit compiles information from pico and local levels, as well as from possible other devices **106**, such as censors measuring the qualities of the production environment (humidity, light etc.). Through a network **120**, e.g. Internet, the terminal unit

Ex. 1006 (Laitinen), 4:12-15

Thanks to collected historical data and improved diagnosis methods, the system also enables individual health surveillance and the creation of remote health care services. Veterinarians can collect local level information with their server **140** and refine that data in their own database **145**.

Ex. 1006 (Laitinen), 5:4-8

Pet., 52-53; Reply, 26

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’515 Patent: Grounds 1-3

Ground 1: Trevarthen Anticipates/ Renders Obvious Claims 1-2

Ground 2: Trevarthen + Brune Renders Obvious Claims 3-4

Ground 3: Trevarthen + Rollins Renders Obvious Claims 15-25

03

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Trevarthen Discloses a "Total Farm Management" System

1[pre] "A computer implemented method of animal tracking, comprising"

The Importance of Utilising Electronic Identification for Total Farm Management: A Case Study of Dairy Farms on the South Coast of NSW.

Author: Adam Trevarthen

6.2.2. Herd Management Software

The ability to digitally store herd information is certainly a valuable tool for all farms, and a necessity for those desiring to utilise RFID to aid in farm management. Herd management software provides farmers with this ability, providing mechanisms for them to store individual cow data into a database. Data can be entered into this software application manually via an easy to use, standardised interface, or alternatively (and predominantly for the purposes of this framework), data can be automatically entered through the use of other digital devices (such as milk meters, cow weight scales – discussed later in this chapter) linked to this database.

Ex. 1005 (Trevarthen), 100

Pet., 11-12

Trevarthen's System Includes an RFID Reader Connected to a Computer

1[a] "connecting a computer to an RFID device reader"

5.2.2.6. Individual cattle information displayed on computer screen – audio readout to alert milkers of cattle requiring particular attention

As each cow passes through the RFID reader, their individual information is displayed on the two computer screens located in the dairy. These screens provide a selection of information pertaining to each cow. This information is drawn from

Ex. 1005 (Trevarthen), 78

6.2.4.2. Wireless Network

Ideally, farmers will be utilising wireless networks in future arrangements. This will enable an array of devices, whether fixed or portable, to be linked directly to real-time data in the herd management database. Such devices include the mainstream computer network devices, such as PDAs (Personal Digital Assistants), laptops, desktop personal computers and printers, however will also provide the vital links to dairy farm devices, such as RFID readers, milking controller units, feed management units, drafting gates, and a vast array of other devices that could be configured to operate under computer control, or require access to herd information for operation.

Ex. 1005 (Trevarthen), 104

Pet., 12-13

Trevarthen's RFID Reader Reads Implanted RFID Devices

1[b] "reading an RFID device implanted in an animal with said RFID device reader"

6.2.1. RFID Tags/Boluses

RFID tags, boluses or microchips form the basis of any dairy farm RFID system. The choice of what RFID device a farm utilises is specifically a matter of personal preference for the farm owners. Each of these devices provide the same functionality, reliability and accuracy, and are intended to last for the life of the cow. Further to this, each device has their own advantages and disadvantages (such as tags being cheaper, boluses being irretrievable until the time of slaughter etc.), leaving the eventual choice of device to the individual farmer to select the device type that best suits their requirements and farm. It is important to note that for the remaining sections of this

Ex. 1005 (Trevarthen), 99

Pet., 13

Trevarthen's System Retrieves Animal ID Information

1[c] "retrieving an amount of animal identification information from said RFID device implanted in an animal"

6.2.3. Fixed RFID Reader

In order to derive any use and subsequent benefit from the practice of identifying every cow with RFID tags, a farm requires an RFID reader device. Subsequently, at every position in which a farmer wishes to utilise a cows RFID number on a regular basis, a fixed RFID reader should be utilised. These provide a reliable and robust source of identification, while also providing a greater range for reading RFID devices than portable RFID readers.

Ex. 1005 (Trevarthen), 102

Pet., 14

Trevarthen's System Records and Analyzes Milk Production

1[d] "linking an amount of animal information of said animal stored in a data base of said computer to said amount of information retrieved from said RFID device implanted in said animal, said amount of animal information stored in said data base of said computer comprising an amount of milk production information or an amount of days milked"

6.3.5.1. Operation

Milk meters are placed in the milk flow line leading from each set of milking cups to the main milk flow line (leading to the vat). From here, the meter can gauge the amount of milk flowing through the pipes from each cow. To be useful, this information should be automatically recorded in the herd management database, and associated with the cow currently registered by the software as being present in that particular bail number. Other pieces of information, such as the time at which the reading took place, the cows bail number, and duration of milking can also be derived from milk meters, and should be stored in the database. These pieces of information serve as solid records of each cow's milking session, and may provide grounds to various analysis activities for the farmer.

Ex. 1005 (Trevarthen), 112

Pet., 14-17

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Trevarthen's System Detects Illness Using Milk Production

1[e] "converting said amount of animal information of said animal stored in said database of said computer linked to said amount of information retrieved from said RFID device implanted in said animal into one or more logical variables"

1[f] "inserting at least one of said plurality of logical variables into at least one logical expression"

1[g] "obtaining a logical value relating to said animal"

6.3.5.5. Illness Detection

Utilising milk meters will also aid to identify any problems that may arise in the herd (such as illness). For example, if a cow provides a significantly lower amount of milk than their usual output, the system will be able to identify this disparity and alert the operators to check this cow when milking has completed. In this way, any illnesses or problems occurring with cows can be identified quickly and easily, subsequently enabling rapid treatment. The quicker that such issues are identified and treated, the

Ex. 1005 (Trevarthen), 115

Pet., 17-21

All Four Arguments Patent Owner Raises Against Ground 1 Fail

Anticipation/Obviousness of Claims 1-2 Based on Trevarthen

Issue 1: Trevarthen was publicly available

Issue 2: Trevarthen discloses the entire claimed arrangement

Issue 3: Trevarthen discloses "connecting a computer to an RFID device reader"

Issue 4: Trevarthen discloses implanted RFID devices

Trevarthen Discloses the System Arranged as Claimed

In **Chapter 5**, Trevarthen describes existing RFID technology at the "Cochrane Dairy."

5.1. The Cochrane Dairy

5.1.1. The Advanced Case Study

This case study was undertaken on the Cochrane dairy farm, located in Pyree (minutes from Nowra) on the NSW South Coast. This farm has been selected as the advanced case study, as it has a strong use of RFID technology, and is well known in the region as one of the most advanced RFID setups. As the farm also utilises RFID tags that are

Ex. 1005 (Trevarthen), 69

In **Chapter 6**, Trevarthen proposes "enhancements" to the Cochrane Dairy for "Total Farm Management."

Chapter 6 – Towards Total Farm Management

6.1. The Current State

Chapters 5 and 6 have demonstrated the operation of a dairy farm without RFID, and also how RFID is currently being utilised at a relatively advanced level for farm management. From these case studies, it is possible to identify numerous common elements evident from both farms, and the assistance that RFID is currently providing to dairy farm management practices. This chapter will attempt to build upon the current RFID usage as identified in the case studies, proposing a framework for the use of RFID on dairy farms, while also proposing enhancements and ideas which could be considered as future additions to further add value to the utilisation of RFID in farm management.

Ex. 1005 (Trevarthen), 99

Pet., 9-11; Reply, 6-10

smaXtec Exhibit 1056
smaXtec, Inc. v. ST Reproductive Technologies, LLC (IPR2024-00875)
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Case Law Supports Petitioners

- *In re Arkley*, 455 F.2d 586 (C.C.P.A.), does not alter the conclusion:
  - Court held a reference (Flynn) did not anticipate because nothing "clearly and unequivocally" directed those skilled in the art to combine examples 4 and 10
- Trevarthen clearly and unequivocally directs those skilled in art to "build upon the current RFID usage" with the "enhancements and ideas" in Chapter 6

> 23. A POSA reading Trevarthen as a whole would have understood it to disclose a complete and cohesive "total farm management" system, which includes (among other things) milk production meters and RFID sensors for temperature. The framework proposed by Trevarthen could have been implemented at the Cochrane Farm, providing numerous potential improvements to the farm. Given the full context and disclosure of Trevarthen, a POSA would "at once envisage" the disclosure as part of a single farm management system.

Ex. 1055 (Brown-Brandl Reply), ¶ 23; *see also id.* ¶¶ 18-24; Reply, 8-9

smaXtec Exhibit 1056
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Case Law Supports Petitioners

- *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376 (Fed. Cir. 2015), is applicable:
  - The claims recited a cutting tool containing ruthenium as a binder and coated using physical vapor deposition (PVD)
  - Federal Circuit found the claims anticipated by a reference that disclosed cutting tools made with five different chemicals used as a binder (one being ruthenium) and three coating methods (one of which was PVD)
  - Court held that the number of combinations was not so many that each "would not be ***immediately apparent to one of ordinary skill in the art***"

Reply, 9

smaXtec Exhibit 1056
smaXtec, Inc. v. ST Reproductive Technologies, LLC (IPR2024-00875)
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Trevarthen's System Includes an RFID Reader Connected to a Computer

5.2.2.6. Individual cattle information displayed on computer screen – audio readout to alert milkers of cattle requiring particular attention

As each cow passes through the RFID reader, their individual information is displayed on the two computer screens located in the dairy. These screens provide a selection of information pertaining to each cow. This information is drawn from

Ex. 1005 (Trevarthen), 78

6.2.4.2. Wireless Network

Ideally, farmers will be utilising wireless networks in future arrangements. This will enable an array of devices, whether fixed or portable, to be linked directly to real-time data in the herd management database. Such devices include the mainstream computer network devices, such as PDAs (Personal Digital Assistants), laptops, desktop personal computers and printers, however will also provide the vital links to dairy farm devices, such as RFID readers, milking controller units, feed management units, drafting gates, and a vast array of other devices that could be configured to operate under computer control, or require access to herd information for operation.

Ex. 1005 (Trevarthen), 104

Pet., 12-13; Reply, 10

smaXtec Exhibit 1056
smaXtec, Inc. v. ST Reproductive Technologies, LLC (IPR2024-00875)
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Trevarthen Discloses Implanted RFID Devices

6.2.1. RFID Tags/Boluses

RFID tags, boluses or microchips form the basis of any dairy farm RFID system. The choice of what RFID device a farm utilises is specifically a matter of personal preference for the farm owners. Each of these devices provide the same functionality, reliability and accuracy, and are intended to last for the life of the cow. Further to this, each device has their own advantages and disadvantages (such as tags being cheaper, boluses being irretrievable until the time of slaughter etc.), leaving the eventual choice of device to the individual farmer to select the device type that best suits their requirements and farm. It is important to note that for the remaining sections of this

Ex. 1005 (Trevarthen), 99

Pet., 13; Reply, 11

smaXtec Exhibit 1056
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Patent Owner's Additional Arguments on Ground 2 Are Wrong

Obviousness of Claims 3 and 4 Based on Trevarthen and Brune

Claim 3: The computer implemented method of animal tracking as described in claim 2, further comprising retrieving an amount of date-time information from said plurality of RFID devices implanted in said plurality of animals.

Claim 4: The computer implemented method of animal tracking as described in claim 3, further comprising retrieving an amount of sensed animal information from said plurality of RFID devices implanted in said plurality of animals.

Issue 1: Trevarthen + Brune renders obvious "retrieving an amount of date-time information from said plurality of RFID devices" (claim 3)

Issue 2: Trevarthen + Brune renders obvious "retrieving an amount of sensed animal information from said plurality of RFID devices" (claim 4)

Trevarthen Discloses Retrieving Sense Information—Temperature

- Trevarthen discloses that "RFID temperature sensing is a currently available technology."

such, details of such devices have not been included in this framework. On the other hand, RFID temperature sensing is a currently available technology, and its use in the livestock industry is currently being investigated.

Ex. 1005 (Trevarthen), 123

6.3.8. Temperature monitoring within RFID

It is evident from the articles of Higgins (2003) and Hostetter (2003) (articles described in section 2.7), that it is possible to incorporate temperature sensing abilities into RFID microchips currently – the application of which may soon be extended to the livestock industry. Such a device will provide the temperature of the cow along with the cows unique identification number every time the tag is read by an RFID reader.

Ex. 1005 (Trevarthen), 121

Pet., 25-26; Reply, 13-14

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It Was Well Known Prior to Trevarthen That Relying on Multiple Parameters Generates a More Reliable Indication of Illness

According to the invention, a more reliable indication signal of heat or illness is obtainable from parameters including one or more of the following: the milk rate of flow, the temperature of a milk flow, the milk yield, and/or the number of times per given time period that an animal pays a visit to the milking parlor or the food quantity consumed in the milking parlor. These parameters for ill or estrous

Ex. 1023 (van den Berg), 4:13-18

6. Detection method

The detection model is meant to draw the attention of the farmer to possible deviations in his cows; the model should generate alerts for that purpose. Alerts can be generated based on yield, temperature, conductivity and activity with the time series models for these variables. With the help of the time series models together

temperature falls outside a certain confidence interval. An illness alert is based on the sum of standardised errors of yield, temperature, activity and concentrates intake.

Ex. 1033 (de Mol), 180-181

Pet., 25-26; Reply, 15-18

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’515 Patent: Grounds 4-6

Ground 4: Laitinen, Buchanan, and Liao Render Obvious Claims 1-2

Ground 5: Laitinen, Buchanan, Liao, and Brune Render Obvious Claims 3-4

Ground 6: Laitinen, Buchanan, Liao, and Rollins Render Obvious Claims 15-25

04

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Laitinen Discloses an Animal Surveillance System

1[pre] "A computer implemented method of animal tracking, comprising"

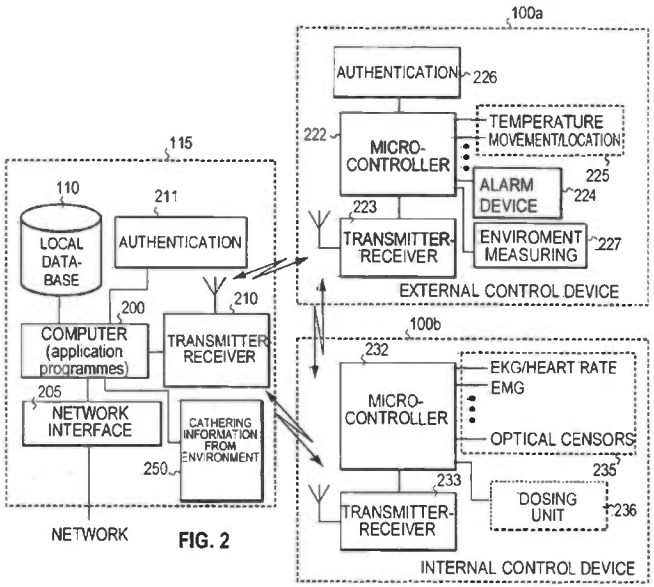

FIG. 2

Ex. 1006 (Laitinen), Fig. 2

(12) **United States Patent**
Laitinen et al.

(10) **Patent No.: US 7,059,275 B2**
(45) **Date of Patent: Jun. 13, 2006**

(54) **SURVEILLANCE SYSTEM FOR ANIMALS**

(75) Inventors: **Arvo Laitinen**, Nurmijarvi (FI); **Tarmo Lankinen**, Latva (FI); **Tiina Varho-Lankinen**, Latva (FI); **Hannu Saloniemi**, Helsinki (FI); **Jarkko Tuomi**, Espoo (FI); **Jarkko Vuori**, Helsinki (FI)

5,189,395 A * 2/1993 Mitchell 340/539.11
5,315,505 A * 5/1994 Pratt et al. 600/300
5,322,034 A * 6/1994 Willham et al. 340/10.41
5,568,119 A * 10/1996 Schipper et al. 340/825.37
5,673,647 A * 10/1997 Pratt 119/51.02
5,791,294 A * 8/1998 Manning 119/721
5,803,906 A * 9/1998 Pratt et al. 600/300

A system for the surveillance of animals includes identification and measuring elements attached to the animals, as well as at least one local level information system (115), wirelessly connected to the identification and measuring elements of a certain group of animals for saving animal-specific measuring results into the information network. Aiming to provide a new kind of a surveillance system for domestic husbandry that enables different interest groups to monitor the kind of a group of animals they wish, the system includes at least one higher level information system, connected to the chosen local level system through a communications network for the reception of animal-specific measuring results from at the minimum one local system, and at least one software application using the data gathered in the higher level system to produce information about the animals to at the minimum one higher level information system by processing the collected data.

Ex. 1006 (Laitinen), Cover, Abstract

Pet., 36-38, 40-41

Laitinen's System Includes a Computer Connected to an RFID Reader

1[a] "connecting a computer to an RFID device reader"

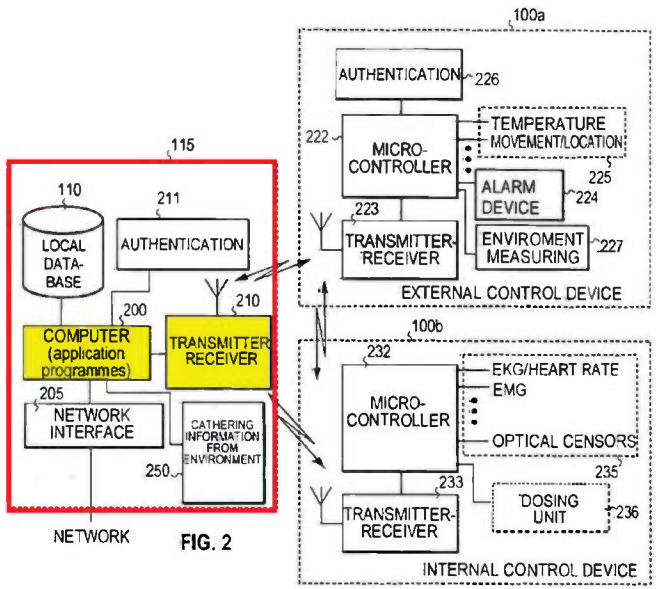

FIG. 2

Ex. 1006 (Laitinen), Fig. 2

The pico level control device is connected to the local information system **115** through a short-range transmitter-receiver **223** or **233**. In the local system the transmitter-receiver **210** that receives the measuring/surveillance data is connected to a computer **200** with the necessary software. Data received from the pico level surveillance devices and possible edited with the computer's application is saved into local databases **110**, from which the users of the global level can access it. As mentioned before, the terminal unit may also feature censors **250** for the measuring of environment information.

Ex. 1006 (Laitinen), 6:5-15

Pet., 41-42

Laitinen's RFID Reader Reads Implanted RFID Devices

1[b] "reading an RFID device implanted in an animal with said RFID device reader"

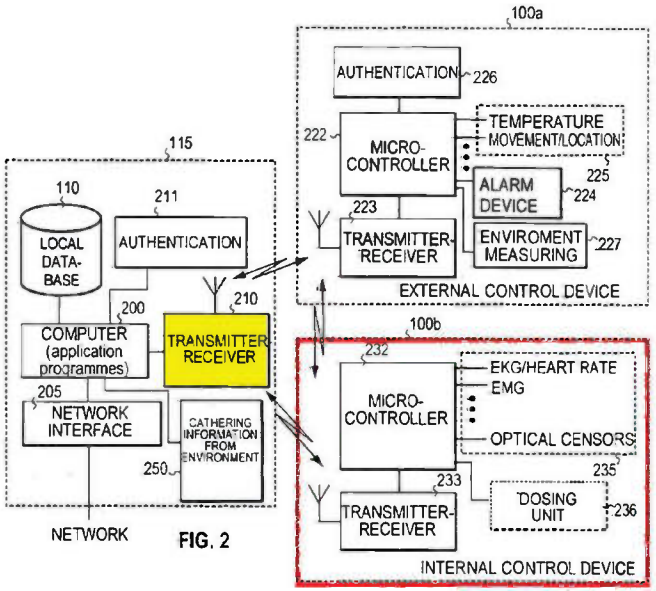

FIG. 2

Ex. 1006 (Laitinen), Fig. 2

Censor unit connected to the micro controller for the surveillance of the animal's body temperature, occlusion, muscular action, motion or metabolic level. The censor 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 (Laitinen), 3:51-57

Pet., 42

Laitinen's System Retrieves Animal ID Information

1[c] "retrieving an amount of animal identification information from said RFID device implanted in an animal"

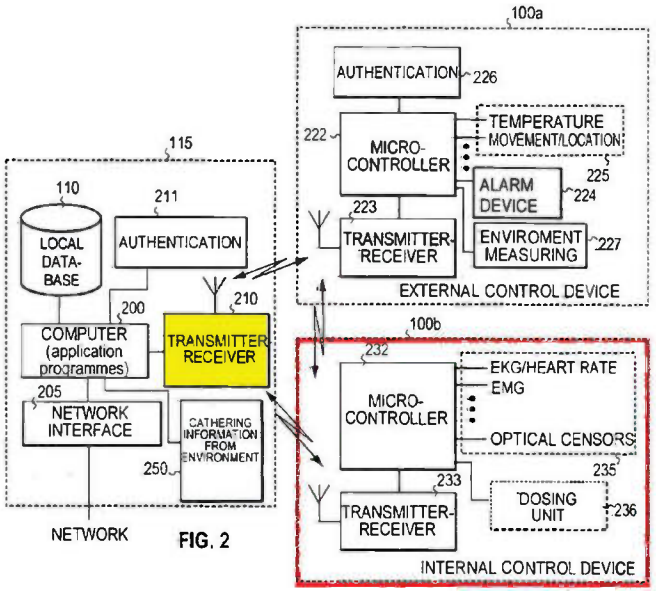

FIG. 2

Ex. 1006 (Laitinen), Fig. 2

The Pico level, i.e., the lowest level comprises the technology used directly with the animals. A pico level device is attached permanently to, e.g., the animal's ear after its birth, and it functions like conventional identification tool. In other

Ex. 1006 (Laitinen), 3:28-31

ing of the animal's medication. Each surveillance device includes a personalized identifier for the correct identification of the animal in question.

Ex. 1006 (Laitinen), 6:2-4

Pet., 43

Buchanan and Liao Disclose Storing Milk Production Information

1[d] "linking an amount of animal information of said animal stored in a data base of said computer to said amount of information retrieved from said RFID device implanted in said animal, said amount of animal information stored in said data base of said computer comprising an amount of milk production information or an amount of days milked"

Buchanan:

Cup sensors or milk meters are becoming available for generating quantitative an qualitative data for milking of individual animals. For example units are available which determine somatic cell count and/or milk volume for an individual animal milking session. The equipment typically includes, either sensors mounted in the milking claw, or a sensor that is mounted in the milk line between the claw and the main milk line of the cow shed.

Ex. 1011 (Buchanan), 19:17-31

Liao:

According to yet another embodiment of the invention, the proposed dairy farm decision relates to whether one or more animals should be subjected to mastitis testing. To this aim, the dairy farm data D includes a first input parameter reflecting an animal identity, and for each identity, parameters indicating one or more of the following: a status of a low-activity alarm (i.e. essentially whether a Registered activity level falls below a threshold level, which may depend on the animal's present movement space), a milk conductivity, a relative milk yield, a somatic cell count (SCC) and a number of days in milk. Preferably, the output

Ex. 1010 (Liao), 15:16-29

Pet., 43-46

Laitinen's System Provides Motivation to Store Milk Production Information With Animal Identification Information

1[d] "linking an amount of animal information of said animal stored in a data base of said computer to said amount of information retrieved from said RFID device implanted in said animal, said amount of animal information stored in said data base of said computer comprising an amount of milk production information or an amount of days milked"

If problems due to overproduction are to be controlled, it is vital that real-time information about the production of agricultural goods, e.g. milk, is available. To be able to control global changes in the levels of production, certain predictability is a precondition. This can only be achieved when data about all factors contributing to the level of production can be gathered from as many a production unit as possible.

Ex. 1006 (Laitinen), 1:36-38

Pet., 43-46

It Would Have Been Obvious to Use Temperature and Milk Production to Make Insemination Decisions

1[e] "converting said amount of animal information of said animal stored in said database of said computer linked to said amount of information retrieved from said RFID device implanted in said animal into one or more logical variables"

1[f] "inserting at least one of said plurality of logical variables into at least one logical expression"

1[g] "obtaining a logical value relating to said animal"

Laitinen uses *multiple variables*, including body temperature, to determine if a cow is in heat:

> underlined numbers. To monitor the animal's heat with a pico level device, body temperature and movement are usually measured. The obtained information is received by

Ex. 1006 (Laitinen), 8:9-11

Liao uses *multiple variables*, including milk production and days in milk, to make insemination decisions:

> Continuing with the insemination example, the system may produce the following table in response to a farmer's/user's inquiry regarding which animals in his/her herd of livestock that should be inseminated today.

Animal ID	DIM	Peak Yield	Av.# Ins./ conception.	Heat	Last Heat	Lactation	BCS
1234	70	50	2,0	Yes	—	1	3,0
2345	60	40	1,5	Yes	21	3	3,5
3456	120	60	3,0	Yes	23	1	2,0

Ex. 1010 (Liao), 12:3-15

Pet., 46-51; Reply, 19-23

It Would Have Been Obvious to Use Temperature and Milk Production Together to Make Treatment Decisions

1[e] "converting said amount of animal information of said animal stored in said database of said computer linked to said amount of information retrieved from said RFID device implanted in said animal into one or more logical variables"

1[f] "inserting at least one of said plurality of logical variables into at least one logical expression"

1[g] "obtaining a logical value relating to said animal"

Laitinen uses data (*e.g.*, temperature) to determine if a cow needs treatment:

> An additional goal can be to find an inverse function $x=f^{1}(y,z)$ with which the necessary medical treatment could be found by analysing the animal's present condition.

Ex. 1006 (Laitinen), 7:35-37

Liao uses milk production to determine illness (mastitis):

> In the case the decision support relates to mastitis testing, the dairy farm data includes a first input parameter reflecting an animal identity, and one or more of parameters, which for each animal identity reflect a status of a low-activity alarm, a milk conductivity, a relative milk yield, a somatic cell count and a number of days in milk. The output data produced by the decision engine includes a first output parameter indicating the animal identity, and a second output parameter reflecting whether the animal with this identity should be tested for mastitis within a particular time period.

Ex. 1010 (Liao), 6:32-7:6

Pet., 46-51; Reply, 19-23

All Three Arguments Patent Owner Raises Against Ground 4 Fail

Obviousness of Claims 1-2 Based on Laitinen, Buchanan, and Liao

Issue 1: A POSITA would have used a logical expression with both temperature and milk production

Issue 2: Laitinen discloses or renders obvious an implanted RFID device

Issue 3: Laitinen discloses "retrieving an amount of animal identification information"

Laitinen Discloses Retrieving Animal Identification Information

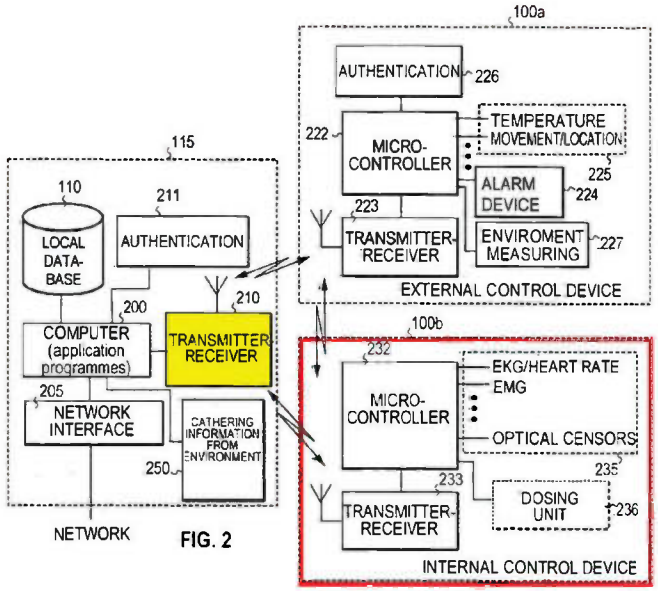

FIG. 2

152. The use of implanted RFID devices for animal identification was well-established. For example, US Patent Pub. No. 2006/0267767 (Ex. 1009) ("Pohlkamp") discloses an RFID device that is implanted as a bolus in the rumen. Ex 1009, [0039], [0041], [0053]("RFID systems can be used for animal identification").

Ex. 1003 (Brown-Brandl Decl.), ¶ 152

The Pico level, i.e., the lowest level comprises the technology used directly with the animals. A pico level device is attached permanently to, e.g., the animal's ear after its birth, and it functions like conventional identification tool. In other

Ex. 1006 (Laitinen), 3:28-31

Censor unit connected to the micro controller for the surveillance of the animal's body temperature, occlusion, muscular action, motion or metabolic level. The censor 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 (Laitinen), 3:51-57

Pet., 51; Reply, 26

It Would Have Been Obvious to Include an RFID Device as Part of an Ingested Bolus

- RFID devices in ingested boluses were well known prior to Laitinen

39. A 2002 study by Prendiville et al. compared methods of remotely measuring bovine body temperature with radio signaling devices, including the Cow Temp™ rumen bolus. Ex. 1021, 4-5. Prendiville noted that while temperatures recorded by the rumen bolus were routinely higher than the standard rectal temperature, the "data demonstrate that the rumen bolus is an effective means of continuously measuring body temperature." Ex. 1021, 11.

Ex. 1003 (Brown-Brandl Decl.), ¶ 39

42. Bewley's 2008 publication (Ex. 1015) describes a study with a specific temperature sensing RFID device, "the Phase IV Cattle Temperature Monitoring System (CTMS; Phase IV Engineering Inc., Boulder, CO) marketed by MaGiiX (MaGiiX, Inc., Post Falls, ID)." Ex. 1015, 4661. The CTMS "uses a passive bolus" that is ingested by the cow "equipped with a temperature sensor, a panel reader placed at a parlor entrance or exit to query the bolus, and a software package to collect, analyze, and view data." *Id.* Thus, as the cow passes the reader, the panel reader retrieves the sensed data from the bolus.

Ex. 1003 (Brown-Brandl Decl.), ¶ 42

GIBSON DUNN

Demonstrative Exhibit – Not Evidence

CERTIFICATE OF SERVICE

A copy of the foregoing exhibit was served via electronic mail on Patent Owner's counsel of record at the email addresses dmoffett@akingump.com, mmahoney@akingump.com, twlanders@akingump.com, jhernandez@akingump.com, AG-ST-SMAXTEC@akingump.com as indicated in Patent Owner's Amended Mandatory Notices, dated October 16, 2024.

DATED: September 4, 2025

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