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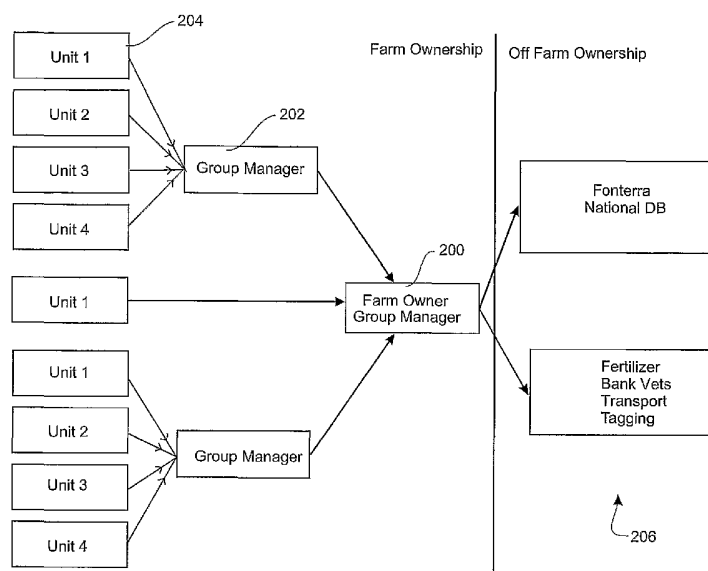
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(54) Title: FARM MANAGEMENT SOFTWARE



(57) Abstract: Farm management software includes at least one database collectively receiving and storing data in association with animal identifiers of individual animals. The data is collected from animals of more than one farm unit. At least one interface is provided to collectively allow access to the databases. Each user of the software has defined access to the data. At least one user has access restricted to data" of the first farm unit. At least one user has access restricted to data of the second farm unit. At least one user has unrestricted access to data of both the first and second farm units. The system thereby allows the manager of each farm unit access to the data of animals under their care. At the same time the software provides a farm owner or supervising manager with access to data of animals in a combined herd across all of the farm units under their ownership or control.

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

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**“FARM MANAGEMENT SOFTWARE”****FIELD OF THE INVENTION**

- 5 The present invention relates to a farm management system particularly though not solely to a farm management system for providing different levels of access and control to different users.

**BACKGROUND ART**

- 10 It is known in the art to provide databases which track various variables in relation to the farming process. For example, in relation to dairy cows it is known to periodically carry out manual tests on the milk output of each animal and record that data over time.

- Japanese Patent Publication No. 2004145580 describes a management system for milk  
15 temperature for use at dairy farm. Data concerning milk temperature in a bulk cooler and concerning washing temperature are stored in a terminal processor at the dairy farm. The stored data are received, recorded and stored by a host computer at a management site via a communication means.

- 20 US Patent Publication No. 20030140865 describes a method and system for managing beef production on a cattle ranch. The system disclosed uses computer software integrated with an individual cow and calf identification system. The software allows a cattle producer to analyze the yearly production characteristics of each individual cow's calf or calves through all the phases of growth and production, and provides an accumulation of the economic cost and gain  
25 of value up to the end product.

- International Patent Publication No. WO03059044 describes a system for collecting data concerning a small ruminant being milked. A teat cup is attached to the ruminant and has antenna to receive and provide predefined signal. A processor interprets the predefined signal  
30 to identify the ruminant being milked.

Japanese Patent Publication No. 2002328967 describes a system for managing breeding milk cows. The system automatically informs a dairy farmer or a veterinarian and an artificial fertilization specialist of an oestrus so that fertilization work can be completed without delay.

European Patent Publication No. 1246096 describes a farm management system, especially for dairy farms. The computer system regulates the amount of feed offered to each animal in a milking shed.

5

European Patent Publication No. 1213676 describes an animal management system for use in farms. Animals are classified automatically by testing property of parameters of each animal with respect to pre-stored passage criterion.

10 European Patent Publication No. 1212938 describes a farm management system for establishing communication connection with mobile communication apparatus to send alarm signal during generation of preset error. The system includes animal identification, milking device and automatic feeding device.

15 International Patent Publication No. WO0217540 describes a farm management plan for production agriculture. The plan includes a mobile device prompting a user to input information pertaining to the farm. The input information is obtained from the user via a global electronic communications network.

20 US Patent No. 6592517 provides a system that scans ear tags attached to animals to identify animals and transmits the identity information to a portable unit for receiving animal health history information.

25 US Patent No. 5803906 discloses a computer system for use in drug treatment of individual animal in cattle feed lot operation. Diagnosis and resulting drug treatment requiring a withdrawal period are both entered into a computer. The computer provides withdrawal period information to a user.

30 Japanese Patent Publication No. 1086823 describes a system for the management of grazing animals such as cattle, horses, goat or the like. The health situation of each animal is monitored by receiving signals at a receiver from transmitters connected to a temperature-measuring device which is set in the ear of each animal.

It would be desirable to have a single farm management system which includes all aspects of farm management allowing for management of multiple farms and/or interacts with third party systems.

## 5 SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a farm management system which goes some way to overcoming any disadvantages in the prior art of which will at least provide the industry with a useful choice.

10

In a first aspect the invention consists in farm management software comprising:

at least one database collectively receiving and storing data collected by data collection means in association with animal identifiers of individual animals, said data collection means comprising:

15 at least one data collection device collecting data of individuals of a first group of animals on a first farm unit, and

at least one data collection device collecting data of individuals of a second group of animals on a second farm unit; and

20 at least one user interface which collectively allow access to data stored in said at least one database, each user having defined access to said data, at least one user having access restricted to data of said first farm unit, at least one user having access restricted to data of said second farm unit, and at least one user having unrestricted access to data of said first and second farm unit.

25 According to a further aspect of the invention said data collection means include at least one data collection device collecting data of individuals of a third group of animals on a third farm unit,

at least one user has access restricted to data of said third farm unit,

30 and at least one user had unrestricted access to data of said first, second and third farm units.

According to a further aspect of the invention said system includes software implementing an animal transfer process enabling a user having access to data of multiple farm units to select a

subset of animals of a donor farm unit to which said user has data access and label said subset for transfer from said farm unit to a receiving farm unit to which said user has data access,

and means to complete said transfer such that data records for said subset of animals are made available to said second user on completion of said transfer.

5

According to a further aspect of the invention wherein said animal transfer process generates control data for driving an automated drafting gate to isolate said subset of animals from other animals of said farm unit.

10 According to a further aspect of the invention said animal transfer process receives data identifying animals passing through a farm entry point of said receiving farm unit and amends location data of records for said identified animals to correspond with said receiving farm unit.

According to a further aspect of the invention said animal transfer process receives data  
15 identifying animals passing through an exit point of said donor farm and generates a record of animals that were identified at the exit point but not at the entry point or were identified at the entry point but not at the exit point.

According to a further aspect of the invention the software includes software implementing a  
20 stock reconciliation process wherein a report is generated for a user in relation to farm units for which said user has data access,

said process including the steps of:

receiving a stock reconciliation date,

reviewing the data record for each animal for each farm unit for which said user has data

25 access,

in said report, identifying said animal as present at said stock reconciliation date if, in reviewing the data record for each animal, there is at least one date after said stock reconciliation date in a field corresponding to an action requiring the animal to have been automatically or manually identified.

30

According to a further aspect of the invention the software includes software implementing a stock security process wherein a report is generated for a user in relation to farm units for which said user has data access,

said process including the steps of:

- 5 -

receiving a stock reconciliation date,  
reviewing the data record for each animal for each farm unit for which said user has data access,

in said report, identifying said animal as present at said stock reconciliation date if, in  
5 reviewing the data record for each animal, there is no after said stock reconciliation date in a field corresponding to an action requiring the animal to have been automatically or manually identified.

According to a further aspect of the invention data stored for each animal includes:

10 medical and treatment data,  
weight and production data, and  
age data.

According to a further aspect of the invention said one or more databases comprise at least one  
15 farm database module for each said farm unit storing data of animals of only the respective said farm unit, and at least one management database module storing data of animals of multiple farm units, and said management database module synchronises with said farm database modules.

20 According to a further aspect of the invention the farm management software comprises at least one on-farm computer system, and at least one off-farm computer system, said on-farm computer system receiving data in relation to the respective farm, and said off-farm computer system receiving data from said on-farm computer system and providing functions to a user including at least a stock transfer order and a consolidated stock reconciliation over multiple  
25 farm units.

According to a further aspect of the invention said on-farm computer system receives data relating to plant and equipment of said farm, and provides functions to a user that enable analysis and reporting in relation to said plant and equipment.

30 According to a further aspect of the invention the consists in a farm management system comprising software as set forth in any one of the above paragraphs, at least one data collection device collecting data of individuals of a first group of animals on a first farm unit, and

at least one data collection device collecting data of individuals of a second group of animals on a second farm unit.

According to a further aspect the invention the farm management system includes at least one data collection device collecting data of individuals of a third group of animals on a third farm unit.

According to a further aspect the invention the farm management system includes an automated drafting gate on at least one said farm unit, adapted to receive communications from said software to draft individual animals from a group of animals passing through said gate.

According to a further aspect the invention the farm management system includes an automated animal identifier at an entry point of said receiving farm unit.

According to a further aspect the invention the farm management system includes an automated animal identifier at an exit point of said donor farm.

According to a further aspect the invention the farm management system includes one or more devices each provided with communications interface for supplying weight and production data to said database, said devices associated with one or more automated animal identifiers such that data from said devices can be associated in said database with a corresponding animal.

According to a further aspect the invention the farm management system includes one or more items of plant or equipment of said farm provided with a communication interface for communicating status information to said software.

According to a further aspect the invention the farm management system includes a mobile data entry device provided with an automated animal identifier for receiving data identifying an animal, and software for receiving said animal identifier, receiving input data in relation an animal, storing said input data and said animal identifier, and uploading said stored data to said database.

To those skilled in the art to which the invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves

without departing from the scope of the invention as defined in the appended claims. The disclosures and the descriptions herein are purely illustrative and are not intended to be in any sense limiting.

## 5 BRIEF DESCRIPTION OF THE DRAWINGS

The preferred embodiment of the present invention will now be described with reference to the accompanying drawings.

10 Figure 1 is a block diagram of one embodiment of the present invention including interaction with local first party systems.

Figure 2 is a block diagram of another embodiment of the present invention including management of a plurality of farm units.

15

Figure 3 is a table showing the database structure and data types.

Figure 4 is a flow diagram of the cup sensing milk-metering process.

20 Figure 5 is a flow diagram of the automatic feeding process.

Figure 6 is a flow diagram of the stock reconciliation report process.

Figure 7 is a flow diagram of the automatic tag reordering process.

25

Figure 8 is a flow diagram of the automatic drafting process.

Figure 9 is a flow diagram of the animal condition checking process.

30 Figure 10 is a flow diagram of the updating process.

Figure 11 is a flow diagram of the animal weighing process.

Figure 12 is a flow diagram of the stock transporting process.

Figure 13 is a flow diagram of the plant monitoring process.

## DETAILED DESCRIPTION

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The present invention relates to a farm management system and to software components of the farm management system. The management system draws together data from multiple farm units under the same management or ownership. The data includes at least data that is derived from individual animals. This data is maintained in relation to the animal from which it is  
10 derived. The system enables the farm managers, share milkers and farm owners to keep track of their business investment.

At the level of each farm unit the farm management system interacts with a range of farm equipment and receives data from a range of data sources. In the preferred embodiment of the  
15 invention this data is stored locally and backed up through each level of the system. The data may also be backed up to a central server.

Users are provided with access to the stored data depending on the level of the user within a hierarchy.

20

The management system may provide for a range of fully or partially automated functions using the stored data. These functions may include stock reconciliation reports, stock traceability searches, controlled stock security, automatic check reordering, plant monitoring, and automatic drafting, live milk volume, vet interaction, and alerts for animals with withholding periods or  
25 other conditions. Each of these preferred functions is described in more detail later in this application. The system also preferably provides for importation of existing data records.

Many functions of the management system are preferably fully automated. For example a farm manager or owner at one location may set a drafting list and animal transfer for action at a farm unit at another location. The system will manage the stock transfer, including booking transport  
30 and adjusting the system records.

Referring to Figure 2 the system of the present invention includes on farm modules 200, 202 and 204 and off farm modules 206. The modules interact to provide management of a multiple

farm units. Preferably each module includes a database and a user interface to the database. The database stores data relating to animals under management. Animal data is initially collected at the farm level into the respective on-farm module. This animal data is propagated (immediately, periodically or occasionally) to modules at higher levels in the hierarchy.

5

Different levels of access to the system are provided to the different levels of managers as appropriate to their role. For example, the farm owner accessing module 200 provides overall control of the hierarchy and has access to the animal and farm records of all of the farm units and control over actions effecting those farm units. A group manager accessing module 202 have charge of a number of farm units. The group manager only has access to the data for those particular farm units and to reports that are appropriate to that level of management. Individual farm unit managers accessing modules 204 are only able to access the data for their own farm unit and any reports which are appropriate for that farm unit.

10

15

Of course the modules that are at higher levels in the hierarchy may be located on a farm unit operated by a manager or owner who has supervisory responsibility for one or more other farm units.

20

Each farm unit may be physically remote from any other farm unit and each module of the present invention are therefore connected through suitable telecommunications means as is known in the art, for example, a wide area network, the internet, a virtual private network, radio links or, less preferably through manual transfer of data.

25

The system may be implemented using any suitable database product. For example the system may be implemented using the INTERBASE database platform available from Borland Software Corporation. The software is installed on each computer and blocks function options depending on where that computer is in the hierarchy structure. The owner computer has no functions blocked, whereas the farm manager will have some blocked functions.

30

The data for a given farm group may be replicated to each database throughout the system, or may be stored in only a single database or may be stored in a subset of databases of the system. For example in the preferred embodiment data is replicated up the hierarchy, so modules at each level only replicate the data stored in the databases at the level below to which they are

linked. In this case user access to data may be naturally constrained by the data available on the respective module being accessed by the user.

Alternatively, the user interface may be programmed to source data from any of the databases in the system, preferring to use the local database for superior performance. However data could also be replicated to all of the database modules throughout the system, or all data could be only stored in a single central database accessible to all users (for example over the IP network). In these cases the user interface controls access to the data according to user identity, and the level of the user within the hierarchy.

Figure 3 is a table of the data structure of each database indicating data categories, the types of data stored, and available data sort options.

Figure 1 illustrates, diagrammatically, the preferred system as it is implemented for a single farm unit. This system is depicted in the way it would be applied to a dairy farm. The system includes a first module 116 located in the milking parlour. This communicates over a network connection to an office module 104.

The in-shed module 116 includes data input interfaces to communicate with plant and equipment 106 located in and around the milking shed. Preferably these interfaces are all implemented in software and all receive data over a standard local area network. For this, equipment providing data is either inherently network capable, or is equipped with a network module to provide identifiable data output on the network. Less preferably the in-shed module may include one or more proprietary interface modules to interface with third party equipment. The equipment from which data may be received includes physical plant (including vats and coolers) 120, power systems 122, feed systems 126, weigh scales 132, milking cup sensors 134, milk meters 129, in line milk analysers 127 and oestrus detectors 128.

The equipment 106 preferably also includes one or more animal identification device 131. The devices are together sufficient to identify each animal to which data from other equipment will relate. The layout and arrangement of races, milking stalls and the like may allow a single identification device to perform this function if the subsequent movement and sequence of animals is sufficiently controlled. Alternatively multiple devices may be required. In the extreme case an identifying device may be required at each piece of equipment where data is

collected. Each device may, for example, be an RFID scanner reading animal identifying data from animal ID tags moving into vicinity of the scanner. Alternatively the device may use other technology to identify animals, such as animal markings or bar codes. Less preferably the device may require user entry, for example a keypad for entering animal numbers.

5

The in- shed module preferably also includes interfaces to output control data for one or more pieces of equipment. Control data may be particularly provided to at least one automated drafting gate. Control data may drive a display in the shed to guide worker activity, for example to provide instructions in relation to an animal.

10

The in-shed module preferably includes program instructions to micro manage the processing of animals through the facility. For example the in-shed module 116 may have a programme to implement a drafting list received from the office module 104. The example program may use identifier data of animals passing an RFID scanner to determine when each animal arrives at a drafting gate, and may provide control data to the drafting gate at the appropriate time to direct animals on the drafting list separately from those not on the list.

15

20

The in-shed module stores data received from the equipment 106 in a database. The in-shed module may process this data to associate data to animal identifiers. Alternatively the in-shed module may time stamp the data so that the data may be subsequently processed at the office module. Data from the in shed module 118 may be continuously, periodically or occasionally transmitted to the office module 104.

25

30

Processing data to associate data with animal identifiers may be programmed in a range of ways. Animal identifier data is received with time information available, and the identity of the sending device provides location information. Equipment data, such as animal weight, is received with time information available, and the identity of the sending device provides location information. Particular program instructions for relating the data depends on the locations of the devices performing animal identification, the locations of the equipment providing animal data and the movement layout of the shed and yards. For example, where an RFID reader is associated with a particular piece of equipment, the program instructions may provide for a simple association of received animal data from this piece of equipment to the animal identifier most recently received from the respective RFID reader. Or in another example, a single RFID reader may provide data indicating a sequence of animals in a race,

with animals the progressing in sequence through multiple items of equipment. In this case the program instructions may generate a sequence of animal identities from data received from the RFID reader. The program may progressively associate animal data to the identities, based on the sequence of data received from each piece of equipment, on the assumption that animals  
5 will remain in the same sequence. Clearly the particular program instructions will be customised for the farm installation. Preferably the module allows for customisation by a detailed configuration interface or by scripting.

Since the configuration for processing animal identifiers and animal data is customised to the  
10 farm it is preferred that this is confined to the in-shed module. The office module for each farm unit then does not require this code, and may be the same as the modules for the off-farm managers.

As already discussed the office module 104 receives data from the in-shed module 116 and  
15 stores this data in a database. The office module has a user interface for accessing this data and implementing management functions in relation to this data and an interface 112 for uploading this data to off-farm modules further up the management tree. The office module 104 may also include interfaces 197 to receive data from, and send data to, other farm systems and data collection devices. For example the office module may have an interface 108 with pasture  
20 management software and an interface 114 for an accounting package. The office module may also include an interface 110 for receiving animal data from a mobile data capture device, such as a personal digital assistant (PDA).

The office module may also have interfaces to one or more off-farm service providers. This  
25 may include interfaces 136 for providing order information and requests, for example to a preferred fertilizer supplier, bank, stock transport company, tag supplier and vet. This may also include interfaces 138 for uploading select animal information to relevant supervisory authorities. For example milk volume and quality data to a contracted milk processor, and individual animal information to a herd evaluation organisation.

### 30 **Management Functions**

Each of the management modules, including the management module on the farm unit and the management module at each subsequent level up the hierarchy, has programmed functions that

utilise the data of the animal database. At different levels in the hierarchy the functions may be effective over a different set or subset of animals. For example a farm owner module at the top of the hierarchy may execute a stock reconciliation report function over animals of an individual farm units or a consolidated report over animals of all farm units.

5

In addition some functions are not applicable to modules at the lowest level in the hierarchy, or are only available to modules at the highest level in the hierarchy. In general however the software component implementing the module preferably includes the functions, but disables the functions for the lower level users.

10

### **Stock Reconciliation Reports**

15

Stock reconciliation reports are normally conducted 6 and 12 monthly. However share milkers and large farms may be required to provide stock reconciliations more frequently as a condition of borrowing money from a bank on the value of the herd.

20

Referring to Figure 6 the stock reconciliation process consists of the program requesting the user to enter a date at which to reconcile at step 600, and the program records this date. Alternatively, or additionally, the program may be scheduled to provide stock reconciliation reports. At step 603, the program determines that each animal is verified if there is a recorded date in any field that updates when RFID is scanned (for example "last milked") or in any field that is updated only when a animal is manually identified (for example "calving date"), that is on or after the reconciliation date entered by the user. The program compiles a report is compiled sorting the herds into verified and unverified animals, and printed at step 604 or

25

emailed at step 606.

30

Preferably the frequency of reports is programmable and time of delivery allocated for reports (e.g.: mating report on all animals, before, during and after mating season). This allows the user to obtain the reports required when desired, simply and easily, and pre program the system to derive reports on demand. For owners and managers of multiple farm units the automated stock reconciliation permits monitoring of farms from remote locations meaning fewer trips to be on-site and an ability to remotely manage the farm investment

### Stock Traceability Searches and Controlled Stock Security

Stock traceability searches and controlled stock security are to enable farmers to keep a track on stock movement. These reports differ from the stock reconciliation reports as they only deal with stock that is missing or has been moved on or off a farm. They provide a live record of what stock is in transit and what stock has not been seen recently.

In the system animal records are attached to individual animals and not to the farm. Animal records including all history available are transferred between databases at the time the animals are transferred between corresponding farm units. Each animal becomes traceable from birth to death across multiple farm units.

Preferably accurate information on transfer of animals is obtained automatically with an extra RFID antenna on the loading race to monitor exactly which animals have entered a truck and which animals exit at the delivery site.

An animal movement process according to the preferred system is illustrated in Figure 12. Animals grouped to leave the farm enter the truck and each RFID tag is scanned at step 1200. Upon receiving this data the program creates a movement event and classifies each animal to a special Mob "in transit" at step 1202. On arrival each animal tag is again scanned at step 1204. Upon receiving this data the program records each animal as being at the new location 1206. The program identifies any animal records which were not recorded as having the "in transit" mob ID. The program stores a list of these animal records at step 1208. The program identifies any animals which are recorded as being in the "in transit" mob, and for which identification data is not received at step 1204. The program includes a list of these records in the exception list at step 1210. A report of the exception list may be printed at step 1212.

Where each database module includes a complete copy of the animal database, or where the database records are only stored centrally, the records for arriving animals will now become available to the farm unit manager due to the change of location data in the animal record. Where the database is fragmented at the farm unit level records corresponding to the arriving animals are downloaded from the central database to the database of the new farm unit.

### Automatic Tag Reordering

Automatic tag reordering replaces the need to visually identify and count cows for tag reordering, also it takes the need of manual labour to find out what tags are “free” within the herd. Instead the system sends a “re order” form to the tag supplier when requested by the user. There are a range of pre-selected orders which the user selects. The system will bill for the tags in monthly payments passing on the costs from the tag supplier.

Referring to Figure 7, the program implementing the automatic tag reordering requests a user to enter a number of new tags required at step 700 together and a type of tag at step 702. At step 704 the program checks for any spare numbers within the existing range, and allocates these numbers first. At step 706 the program compiles a list of tag numbers together with corresponding tag information. If the internet is available the program may generate an XML order, and forward this electronic order to the supplier at step 708. Otherwise an order may be printed at step 710 for sending by the user.

Occasionally tag orders placed outside the peak “tag season” will receive a discount. Accordingly the better tags are managed the cheaper the whole process becomes. The automated system allows available animal numbers to be accurately identified. This reduces the potential to have double ups, and removes the need to manually search and derive available numbers.

### Plant Monitoring

Plant Monitoring enables the farmer to record data from the milking and wash plants. This data is received in real time, and the system may provide alerts when data falls outside preset ranges.

Various sensors are connected to the plant, which in turn connect to an interface system. The interface system then connects to the computer and provides the data to the farm management system. The data may include:

- Plant electric motor - on/off. The system may use this for several functions. If the plant is on for greater than a predetermined duration the system may send an alert. The system may provide indication of the amount of power used by plant. This data may be used as a gauge to measure and look for reasons for fluctuations in power usage. The system may

- 16 -

monitor voltage fluctuation to assist in managing the plant electric motor, ensuring the motor is not burning out unnecessarily or being over stressed.

- Effluent pump - on/off. The system may send an alert if the time on is greater than a predetermined duration.

5       

- Chillers - on/off and voltage fluctuation. The system helps manage the power usage from the chiller units.

10       

- Vat temperature. The system may send an alert if chillers are on for greater than a predetermined duration, and yet milk temperature is not below a predetermined level. This check may be repeated periodically, for example every 4 hours. This data indicates the temperature of milk inside the vat at any given time and provides alerts to the manager if vat temperature is not at appropriate levels. This helps mitigate potential for milk to be stored at inappropriate temperatures.

15       

- CIP Pump - on/off
- Hot Water Cylinder temperature. May provide an alert if the temperature is below a predetermined threshold for a predetermined time. This allows fine tuning of plant cleaning and accurate management of the water temperature

20       

- Milk and Water temperatures in and out of cooler plate. Monitoring water flow volumes can allow improved management of water use. An alert may be generated if milk flowing out of the heat exchanger is above a predetermined temperature. Where volume flow of milk is measured this may include comparison of the inlet and outlet milk flows to determine the integrity of the heat exchanger.

25       

- High Pressure Pump - on/off. An alert may be generated if the high pressure pump is on for longer than a predetermined time. This may provide early warning of an on farm leak with irrigation systems.

25       

- Mains Power. Provides an indication total power usage of the farm. A record of mains power consumption is also useful as to gauge and control fluctuations in power used on a day to day basis.

30       

- Live milk Volume.
- Live Milk Temp.

Referring to Figure 13, the plant monitoring sub-system in the in-shed module reads each of the states and variables of the plant that have been received on the interface or on the network at step 1300 and stores them in memory. The management module periodically downloads the

stored data at step 1302. Various monitoring events can be pre-programmed. The management computer reviews the defined monitoring events at step 1304. The program determines at step 1306 if any of the plant states or variables is outside a predetermined threshold. Where the value is outside the predetermined range the program generates and records an exception at step 1308 and the user informed.

### **Automatic Drafting**

Automatic drafting will enable the farmer to draft stock without having to visually identify the animals as well as not having to do the actual drafting. In a rotary cow shed when the cow is to be drafted, a series of gates may be used to automatically direct the animal to a desired location.

Referring to Figure 8 each cow is identified via the RFID tag at step 800. The automatic drafting program of the in shed module receiving the animal data queries the office module and retrieves any drafting information about this animal at step 802. For example the animal record may indicate that the animal is intended for transportation or treatment by the vet. If the animal is scheduled for drafting the program generates control data for sending to an automated drafting gate. The control data is such that the drafting gates are set to an alternate location for example a left holding pen 804 or a right holding pen 806. Otherwise the gate is set to the normal central position 808 to follow the rest of the herd.

This allows animals to be drafted automatically in response to systems determined conditions for example oestrus detection therefore drafted for artificial insemination, or manually selected either by a switch or via remote control. The Remote control allows the farmer to use the drafting system to draft a cow requiring some action upon exiting the milking platform. For scheduled drafting the farmer enters the animal number, where and when to draft to the system and the rest is carried out automatically.

### **Vet Interaction**

Vet interaction enables the vet to have full animal history on screen with livestock information that has been updated by the farmer on any occurrence of treatments. This also enables the vet to update any treatments they have given to an animal during their visit. The vet uses a touch screen computer, preferably wireless with batteries so it can be carried around the shed and

communicates to the farm management module via a wireless network. Figure 5 is a table of the data the vet can enter into the system.

### Importing Existing Records

5

The management module is preferably programmed with an import interface to import existing records from other hardware and also from third party databases. An example is a portable digital assistant (such as a Palm Pilot) using XML data transfer with the system. the transfers can occur over the internet, a wireless network, temporary USB connection, or Ethernet.

10

### Alerts to Animals with Withholding Periods or Other Conditions

15

A withholding alert function is preferably included in the in shed module to provide an alarm signal in relation to any animals that should not be milked. A withholding period may be specified due to recently having penicillin or other non milking conditions. The alerts are provided as the animal passes under an RFID antenna letting the worker know that this animal should be drafted off, or the animal may be automatically drafted off by the program generating control data for an automatic drafting gate. In a dairy situation the animal may be withheld due to unsuitability for milking, for example due to recent drug administration. Alternatively, on a dry stock farm unit the animal may be withheld from a shipment of animals destined for slaughter.

20

25

Figure 9 illustrates a program suitable for execution in a rotary milking shed environment. Here the animals are each drafted into a milking bale on a rotating platform in a continuous sequence. Farm workers can remain in one location adjacent an entrance location, applying milking cups to each animal as the bale (and cow) pass the location of the worker. Another worker located immediately before an exit location removes cups from animals as they pass that location. The animal then leaves the platform and exits the shed.

30

The program of Figure 9 operates with a single RFID reader provided immediately in advance of the location of the worker applying cups. An RFID tag is preferably provided associated with each bale. The RFID reader thus scans for animal tags and for bale tags. An on screen alert and an audio alert will appear and sound when an alarm condition is detected.

Referring to Figure 9 when one of the antennas reads a tag data is transmitted to the in-shed module. The data is read in by the program at step 900. The module determines at step 902 whether the data indicates a bale tag or at step 904 that the data indicates an animal tag. Once the program identifies the presence of an animal tag it retrieves animal information from the management module. At step 906 the program associates the animal identifier with the most recently identified bale. The program sends data to a user display indicating animal and bale information. The program ascertains from the animal record whether the animal is subject to a withholding period. Where the program determines the application of a withholding period then at step 908 the program displays animal condition information and signals an alert. The program may automatically proceed to draft the animal out of the bale, or may request a user confirmation on a user interface provided to the farm worker. Where the program determines or is instructed that drafting is required, the program creates and records a drafting event at step 910.

#### **Cup Sensors / Milk Meters**

Cup sensors or milk meters are becoming available for generating quantitative and 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.

Elevated somatic cell count can indicate the onset of a mastitis condition. A program function of the milking shed module may monitor somatic cell count data from the milk analysis equipment. If the somatic cell count is greater than a predetermined level the program generates an alert and a drafting instruction in relation to the animal.

Referring to Figure 4, each cup sensor preferably detects somatic cell count at step 400. The milk meter preferably reads milk volume and or flow rate at 402. This data is sent over the network to the in-shed module. The program stores these readings to be associated with the particular animal being milked at step 404. The program determines if any of the received values are outside of a preset range. If the values fall outside a preset range the program determines whether the animal is to be automatically drafted. This may depend on a preset user preference. If the animal is to be automatically drafted the program generates a

drafting event at step 406. If drafting is not to be automatically conducted the program instead creates and records an exception, and generates display data for the farm worker at step 408.

## Weighing

5

Automated weighing is preferably arranged to occur while the animal is inside a drafting race. The animal weigh scales send out an automatic reading of animal weight. This is received by the farm management system of the present invention. This enables animal weight gain and loss to be plotted on a graph, this information will be available through the system to assist with stock management decisions, such as animal culling. Weighing can also assist with balancing milk volume, grass consumption and weight gain or loss.

10

The weigh scales preferably sit under the drafting race (which has a floor). Once an individual animal has been trapped on the floor, the weight will be recorded by the scales. The recorded weight is sent on the networked output of the scale reader back to be read by the in-shed module.

15

An automated weighing process is described with reference to Figure 11. An RFID antenna is located just before or in a drafting unit. The RFID reader detects the entry of an animal to the scales at step 1100 and outputs this data onto the network at step 1102. The in-shed module program reads the animal identity data from the RFID reader associated with the scales, and reads the weight data sent from the scales. The program determines an animal identity from the tag data. The program then reviews the animal record to determine whether that animal has already been weighed on this occasion at step 1104. Where the record indicates the animal has already been weighed the program proceeds to provide control data to release the animal. Where the animal has not been weighed the program associates the succeeding weight reading with the immediately preceding animal identity, and records the weight and date in the animal record at step 1106.

20

25

Under this system individual animal weight details can be consistently determined, ensuring accurate weight data is recorded for each individual animal. The system can be used to weigh the herd or a selection of the herd on a daily basis with minimal impact of exit speed of animals from the milking platform.

30

### Oestrus Detection

Detecting when a cow is on heat can be done through the cup sensors checking the milk or alternatively the sensors or camera taking a temperature reading from the cows stomach, or an external sensor taking a temperature reading of the cow to determine if the cow is on heat. This information may be placed on the network for retrieval into the farm management system. The management system may be programmed to automatically draft cows for artificial breeding when the cows are on heat.

In one embodiment cup sensors can be installed on each bale of the rotary milking platform for accurate oestrous detection. An alternative embodiment is to install a thermo camera to gauge the internal heat of a cow passing the camera.

### Feed Systems

The farm installation may include an automated system for feeding the animals supplements of fodder. This will enable the farm manager to automatically feed a cow depending on its weight and production.

This system is illustrated briefly by Figure 5. At step 5 the user enters feed criteria either for that cow specifically or as general rules. An RFID reader detects an animal entering a bale from its tag. The tag data is placed on the network and the in-shed module identifies the animal from the tag data at step 502. The module applies the feed criteria at step 504 to calculate the appropriate feed amount and determine if the animal requires feeding. If the program determines that the animal is to be fed, the program generates control data at step 506 for an automated feeder.

### Mobile Interface

According to one aspect the management modules of the present invention may receive data updates using a mobile data acquisition device, such as a personal digital assistant (PDA), mobile phone, or similar handheld computer. The device preferably includes a radio frequency identification device (RFID) scanner. This is used for scanning animals into the system and recording update data corresponding to any treatments or events of the animal record. The

device may also include functions to assist with pasture management. The information captured in the device is uploaded to one of the management modules and is propagated to the other databases of the system. Upload may be by wireless network, or by local interface, such as USB connection.

5

The mobile interface can be used to identify animals not in the milking shed. Animals can be scanned anywhere at anytime- for example while in a paddock or holding pen. Preferably the device connects by wireless network and can download all records in relation to an identified animal.

10

The mobile device may include a new animal entry program. Preferably calves are tagged, the tags are scanned, and relevant data is entered using the mobile device as they are born. Additional data may include the mother cow identity

15 The mobile interface may also be used by or in cooperation with the vet to enter information and keep consistent animal health records.

### System Updates

20 Preferably all system updates can be spread to modules of the system via the communications network. This means the system can send all debugging and program updates automatically out to modules without user intervention. Upgrades preferably include a roll back option so that users can revert the system back to the previous version.

25 The preferred update implementation is described with reference to Figure 10. The modules according to the present invention are programmed to connect to the module immediately above it in the hierarchy or alternately the central server whenever a network connection is available. The program reads the latest version number of the software of the module above it, and compares this against its own version information at step 1000. If the installed version is less  
30 than the latest version the program displays the release notes at step 1002. The program requests the user approve an update at step 1004. If approval is provided the new version is downloaded and installed at step 1006.

Accordingly the present invention relates to a farm management system. The farm management system preferably interacts with a number of local farm systems and data sources. The data is preferably stored locally and backed up through the levels of the system Monitoring and alerts are provided depending on the level of the user within a hierarchy. Interaction with external third-party systems is optional with both online and manual data transfers possible. System updates are preferably replicated through the system each time a connection is made.

The management system draws together data from multiple farm units under the same management or ownership. The system enables the farm managers, share milkers and owners to keep track of their business investment. With the system the management team are involved in the farming process more closely. Employers and employees have input and access to farm information with recognition of goals through recording and reporting.

The management system may provide stock reconciliation reports, stock traceability searches, controlled stock security, automatic check reordering, plant monitoring, and automatic drafting, live milk volume, vet interaction, and alerts for animals with withholding periods or other conditions. Each of these preferred functions is described in more detail later in this application. The system also preferably provides for importation of existing data records.

Many functions of the management system are partially or fully automated. For example a farm manager or owner may set a drafting list and animal transfer for action at a farm unit of another location. The system will manage the stock transfer, including booking transport and adjusting the system records.

**CLAIMS:**

1. Farm management software comprising:

5 at least one database collectively receiving and storing data collected by data collection means in association with animal identifiers of individual animals, said data collection means comprising:

at least one data collection device collecting data of individuals of a first group of animals on a first farm unit, and

10 at least one data collection device collecting data of individuals of a second group of animals on a second farm unit; and

at least one user interface which collectively allow access to data stored in said at least one database, each user having defined access to said data, at least one user having access restricted to data of said first farm unit, at least one user having access restricted to data of said  
15 second farm unit, and at least one user having unrestricted access to data of said first and second farm unit.

2. Farm management software as claimed in claim 1 wherein said data collection means include at least one data collection device collecting data of individuals of a third group of  
20 animals on a third farm unit,

at least one user has access restricted to data of said third farm unit,

and at least one user had unrestricted access to data of said first, second and third farm units.

25 3. Farm management software as claimed in claim 1 wherein said system includes software implementing an animal transfer process enabling a user having access to data of multiple farm units to select a subset of animals of a donor farm unit to which said user has data access and label said subset for transfer from said farm unit to a receiving farm unit to which said user has data access,

30 and means to complete said transfer such that data records for said subset of animals are made available to said second user on completion of said transfer.

4. Farm management software as claimed in claim 3 wherein said animal transfer process generates control data for driving an automated drafting gate to isolate said subset of animals from other animals of said farm unit.

5. Farm management software as claimed in either claim 3 or claim 4 wherein said animal transfer process receives data identifying animals passing through a farm entry point of said receiving farm unit and amends location data of records for said identified animals to correspond with said receiving farm unit.

6. Farm management software as claimed in claim 5 wherein said animal transfer process receives data identifying animals passing through an exit point of said donor farm and generates a record of animals that were identified at the exit point but not at the entry point or were identified at the entry point but not at the exit point.

7. Farm management software as claimed in any one of claims 1 to 6 including software implementing a stock reconciliation process wherein a report is generated for a user in relation to farm units for which said user has data access,

said process including the steps of:

receiving a stock reconciliation date,

reviewing the data record for each animal for each farm unit for which said user has data access,

in said report, identifying said animal as present at said stock reconciliation date if, in reviewing the data record for each animal, there is at least one date after said stock reconciliation date in a field corresponding to an action requiring the animal to have been automatically or manually identified.

8. Farm management software as claimed in any one of claims 1 to 7 including software implementing a stock security process wherein a report is generated for a user in relation to farm units for which said user has data access,

said process including the steps of:

receiving a stock reconciliation date,

reviewing the data record for each animal for each farm unit for which said user has data access,

in said report, identifying said animal as present at said stock reconciliation date if, in reviewing the data record for each animal, there is no after said stock reconciliation date in a field corresponding to an action requiring the animal to have been automatically or manually identified.

5

9. Farm management software as claimed in any one of claims 1 to 8 wherein data stored for each animal includes:

medical and treatment data,  
weight and production data, and  
age data.

10

10. Farm management software as claimed in any one of claims 1 to 9 wherein said one or more databases comprise at least one farm database module for each said farm unit storing data of animals of only the respective said farm unit, and at least one management database module storing data of animals of multiple farm units, and said management database module synchronises with said farm database modules.

15

11. Farm management software as claimed in any one of claims 1 to 10 comprising at least one on-farm computer system, and at least one off-farm computer system, said on-farm computer system receiving data in relation to the respective farm, and said off-farm computer system receiving data from said on-farm computer system and providing functions to a user including at least a stock transfer order and a consolidated stock reconciliation over multiple farm units.

20

12. Farm management software as claimed in claim 11 wherein said on-farm computer system receives data relating to plant and equipment of said farm, and provides functions to a user that enable analysis and reporting in relation to said plant and equipment.

25

13. A farm management system comprising software as claimed in any one of claims 1 to 12 at least one data collection device collecting data of individuals of a first group of animals on a first farm unit, and

30

at least one data collection device collecting data of individuals of a second group of animals on a second farm unit.

- 27 -

14. A farm management system as claimed in claim 13 and claim 2 including at least one data collection device collecting data of individuals of a third group of animals on a third farm unit.

15. A farm management system as claimed in claim 12 or claim 13 and claim 3 including an automated drafting gate on at least one said farm unit, adapted to receive communications from said software to draft individual animals from a group of animals passing through said gate.

16. A farm management system as claimed in any one of claims 13 to 15 and claim 3 including an automated animal identifier at an entry point of said receiving farm unit.

17. A farm management system as claimed in any one of claims 13 to 16 and claim 3 including an automated animal identifier at an exit point of said donor farm.

18. A farm management system as claimed in any one of claims 13 to 17 including one or more devices each provided with communications interface for supplying weight and production data to said database, said devices associated with one or more automated animal identifiers such that data from said devices can be associated in said database with a corresponding animal.

19. A farm management system as claimed in any one of claims 13 to 18 and claim 11 including one or more items of plant or equipment of said farm provided with a communication interface for communicating status information to said software.

20. A farm management system as claimed in any one of claims 13 to 19 including a mobile data entry device provided with an automated animal identifier for receiving data identifying an animal, and software for receiving said animal identifier, receiving input data in relation an animal, storing said input data and said animal identifier, and uploading said stored data to said database.

21. A farm management system substantially as herein described with reference to and as illustrated by the drawings.

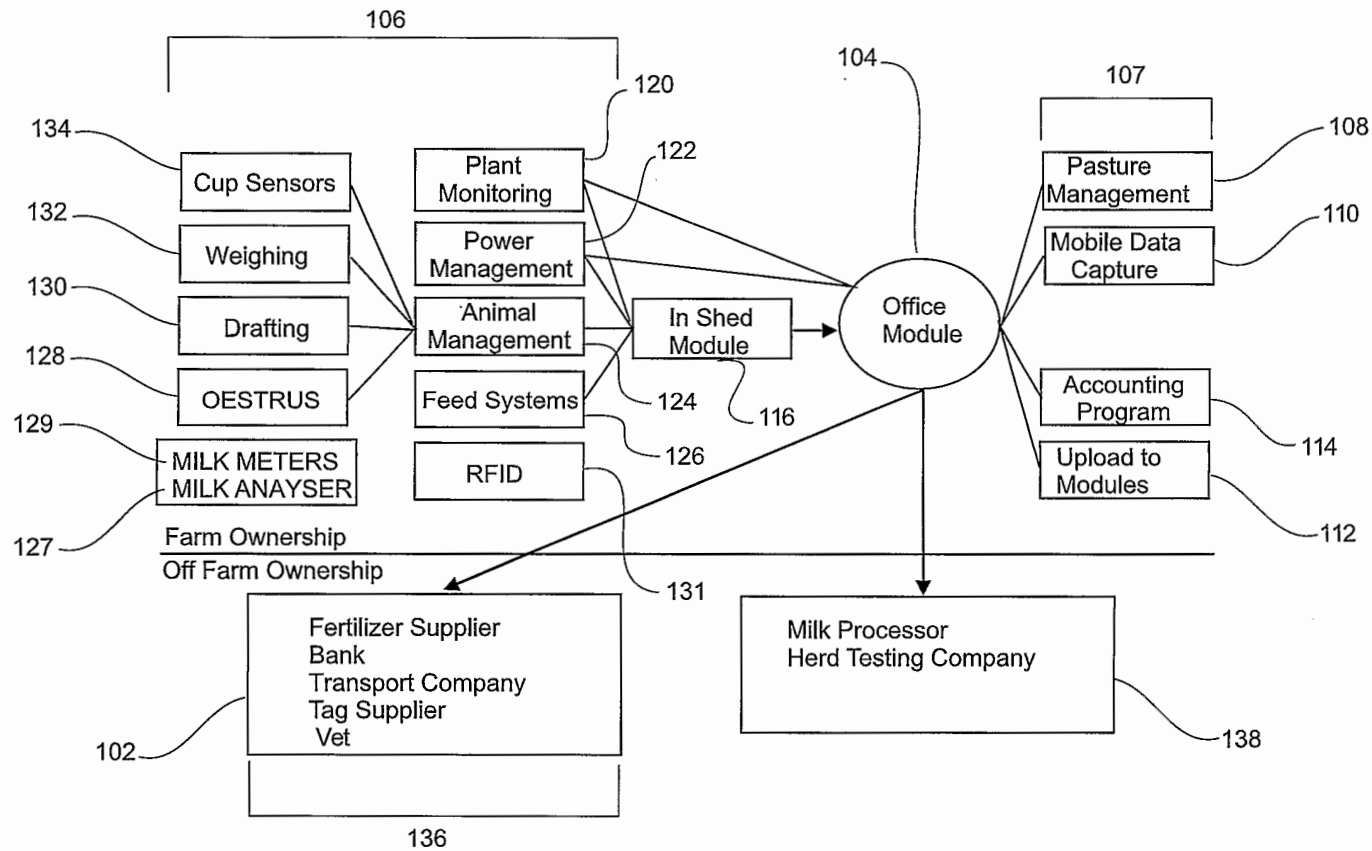


FIGURE 1

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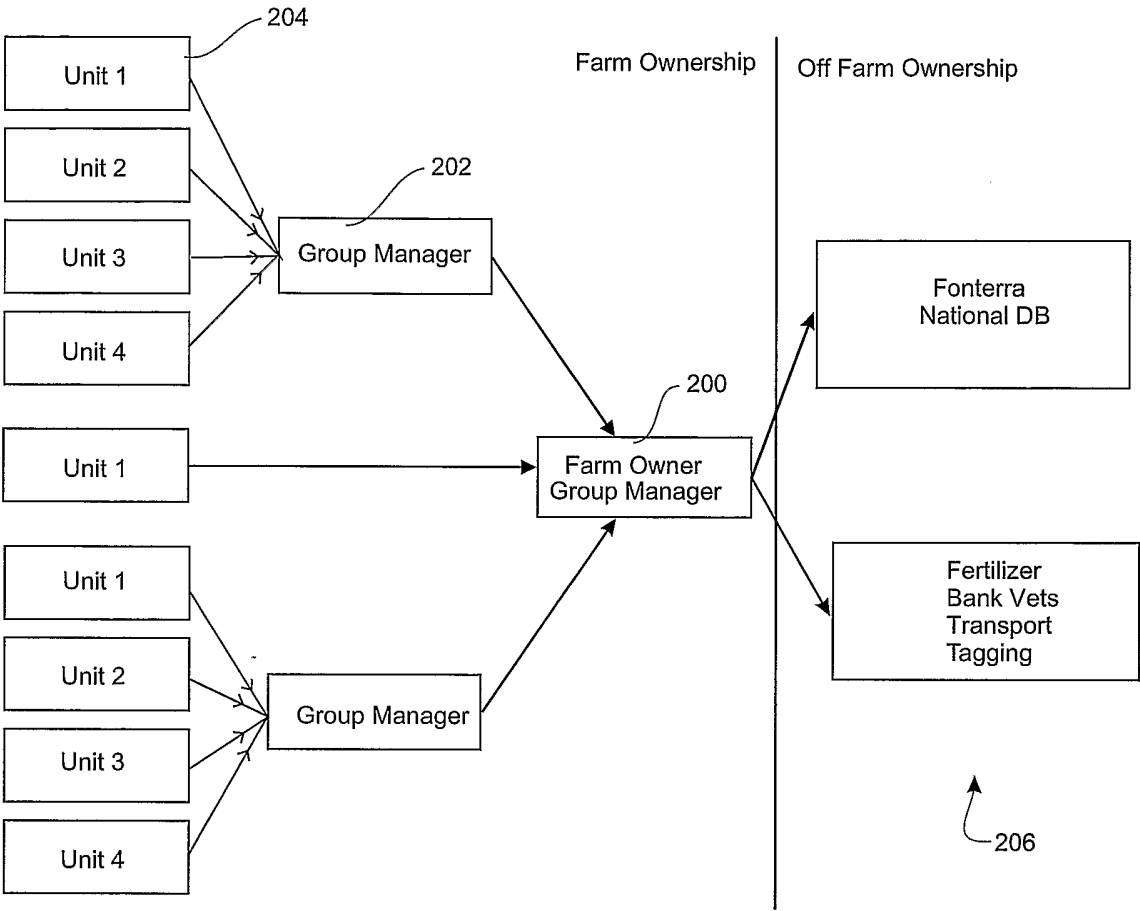


FIGURE 2

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| Category            | Search                                           | Sort                |
|---------------------|--------------------------------------------------|---------------------|
| Animal Details      | RF ID                                            | Ascending           |
| Calving Details     | Age                                              | Descending          |
| Oestrus / Mating    | Animals that missed their last predicted oestrus | Time Hrs            |
| Herd Test Details   | Arrival Date                                     | Time Days           |
| Location / Property | Breed                                            | Time Weeks          |
| Medication / Types  | Bull ID                                          | Time Years          |
| Movements           | Calf Fate                                        | Mean                |
| Disease / Treatment | Calving Date                                     | Medium              |
|                     | Calving Due Date                                 | Less -%             |
|                     | Calving Ease                                     | Top -%              |
|                     | Condition Score                                  | Start & Finish Date |
|                     | Cycle Length                                     |                     |
|                     | Date Arrived                                     |                     |
|                     | Date of birth                                    |                     |
|                     | Days in Milk                                     |                     |
|                     | Dry off Date                                     |                     |
|                     | Estimated Cycle                                  |                     |
|                     | Excess Fat kg/%                                  |                     |
|                     | Excess Litres of Milk                            |                     |
|                     | Excess Milk Solids                               |                     |
|                     | Excess Milk Solids/day                           |                     |
|                     | Excess Protein kg/%                              |                     |
|                     | Fat kg/%                                         |                     |
|                     | First Milking Date                               |                     |
|                     | Hasn't cycled                                    |                     |
|                     | Herd ID                                          |                     |
|                     | Last cycled                                      |                     |
|                     | Last Milked                                      |                     |
|                     | LIC ID                                           |                     |
|                     | Litres of Milk                                   |                     |
|                     | Location                                         |                     |
|                     | Location calved                                  |                     |
|                     | Mating dates                                     |                     |
|                     | Mating Type                                      |                     |
|                     | Meat Withholding Expires                         |                     |
|                     | Milk Abnormality                                 |                     |
|                     | Milk solids                                      |                     |
|                     | Milking Status                                   |                     |
|                     | Milk Withholding Expires                         |                     |
|                     | Mob ID                                           |                     |

FIGURE 3

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| Category | Search                         | Sort |
|----------|--------------------------------|------|
|          | New Animal                     |      |
|          | Number of cycles               |      |
|          | Number of times calved         |      |
|          | PD Result/Confirmation         |      |
|          | Predicted cycling              |      |
|          | Predicted Dry off Date         |      |
|          | Predicted Oestrus              |      |
|          | Previous owner                 |      |
|          | Protein kg/%                   |      |
|          | Reason for Drying off          |      |
|          | Reproductive Status            |      |
|          | Sex                            |      |
|          | Somatic Cell Count             |      |
|          | Start Milking Date             |      |
|          | Test Dates                     |      |
|          | Total Milk Volume              |      |
|          | Weight                         |      |
|          | Year calved                    |      |
|          | Farm Address                   |      |
|          | Medication / Types             |      |
|          | Who added the event/treatment? |      |
|          | Disease                        |      |

**FIGURE 3 - cont.**

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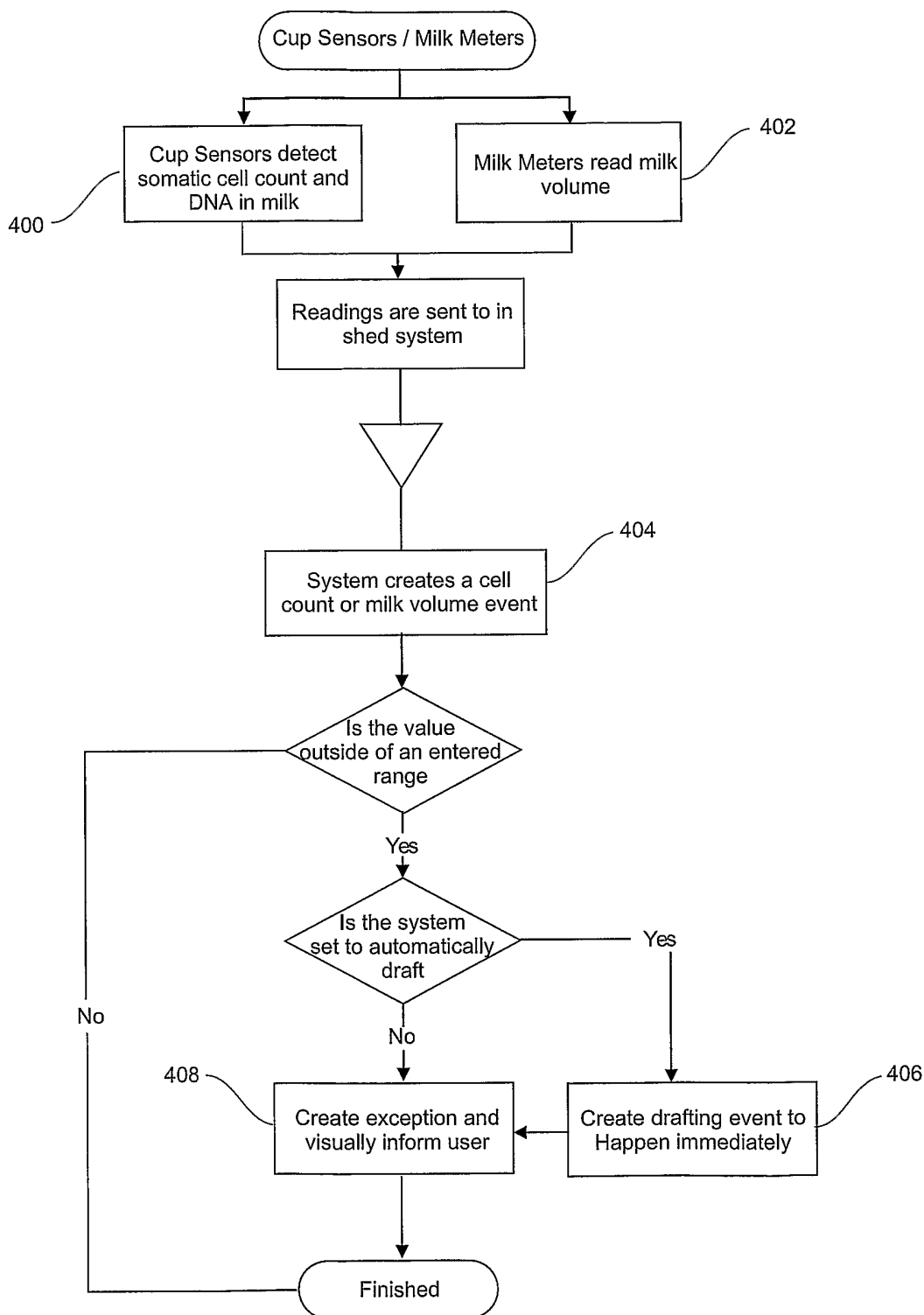
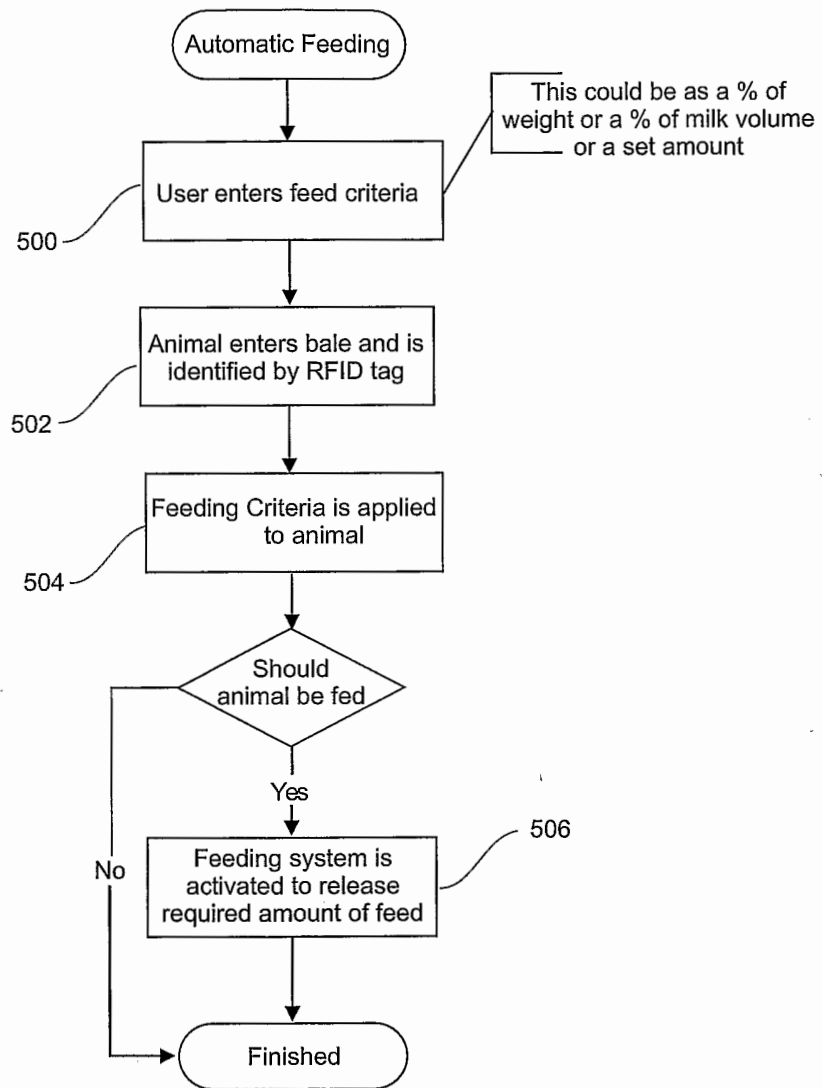


FIGURE 4

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**FIGURE 5**

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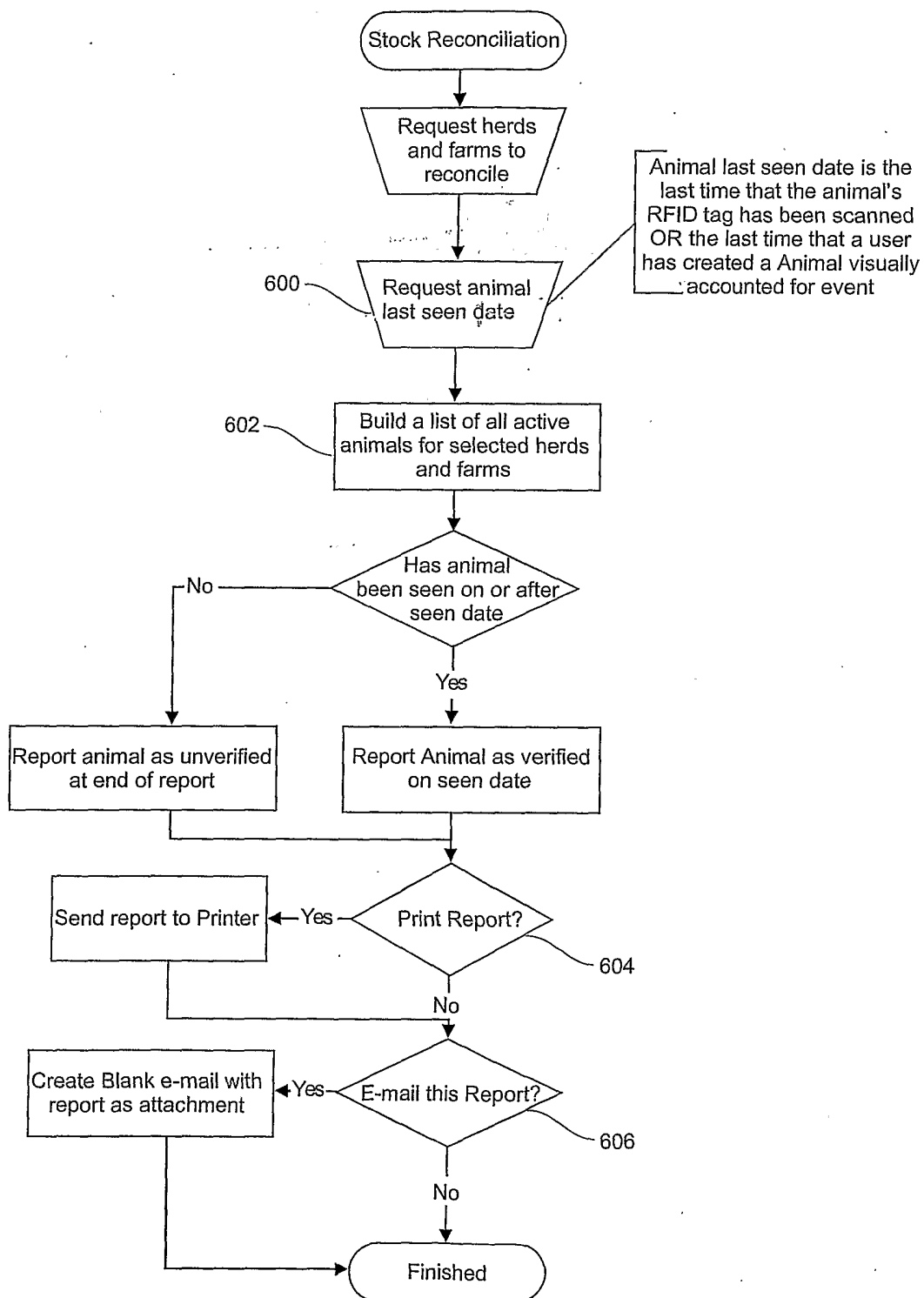
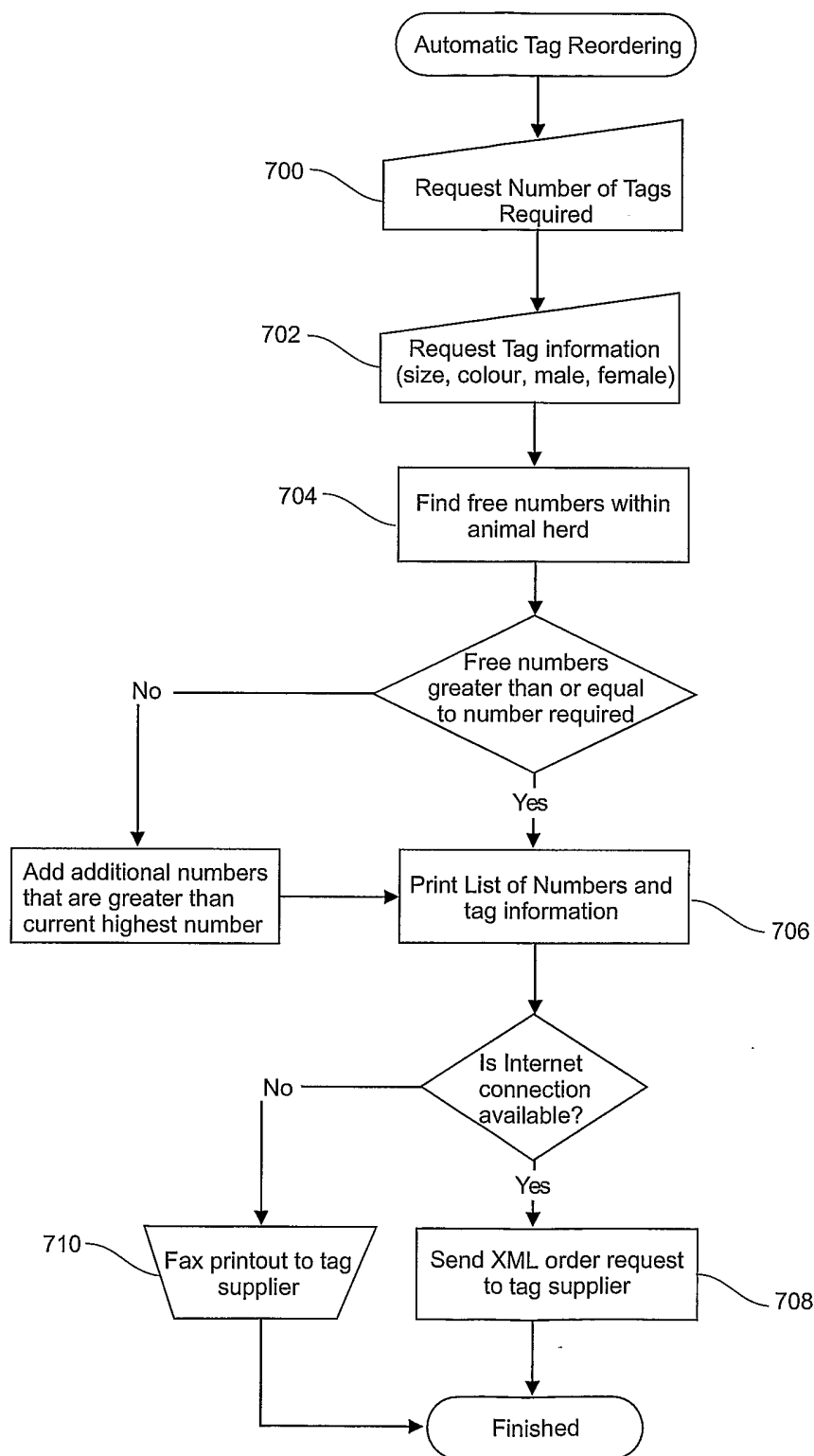
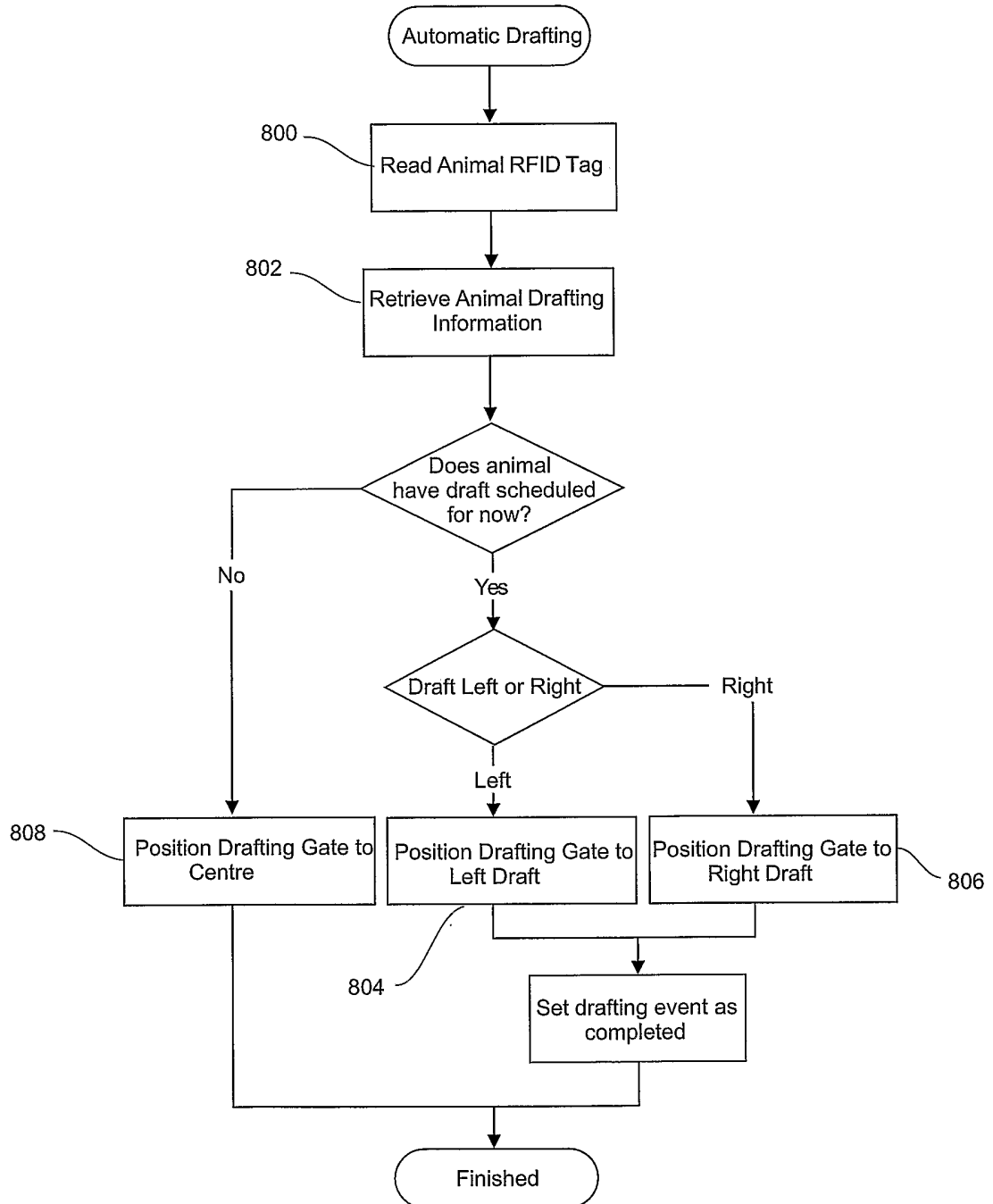


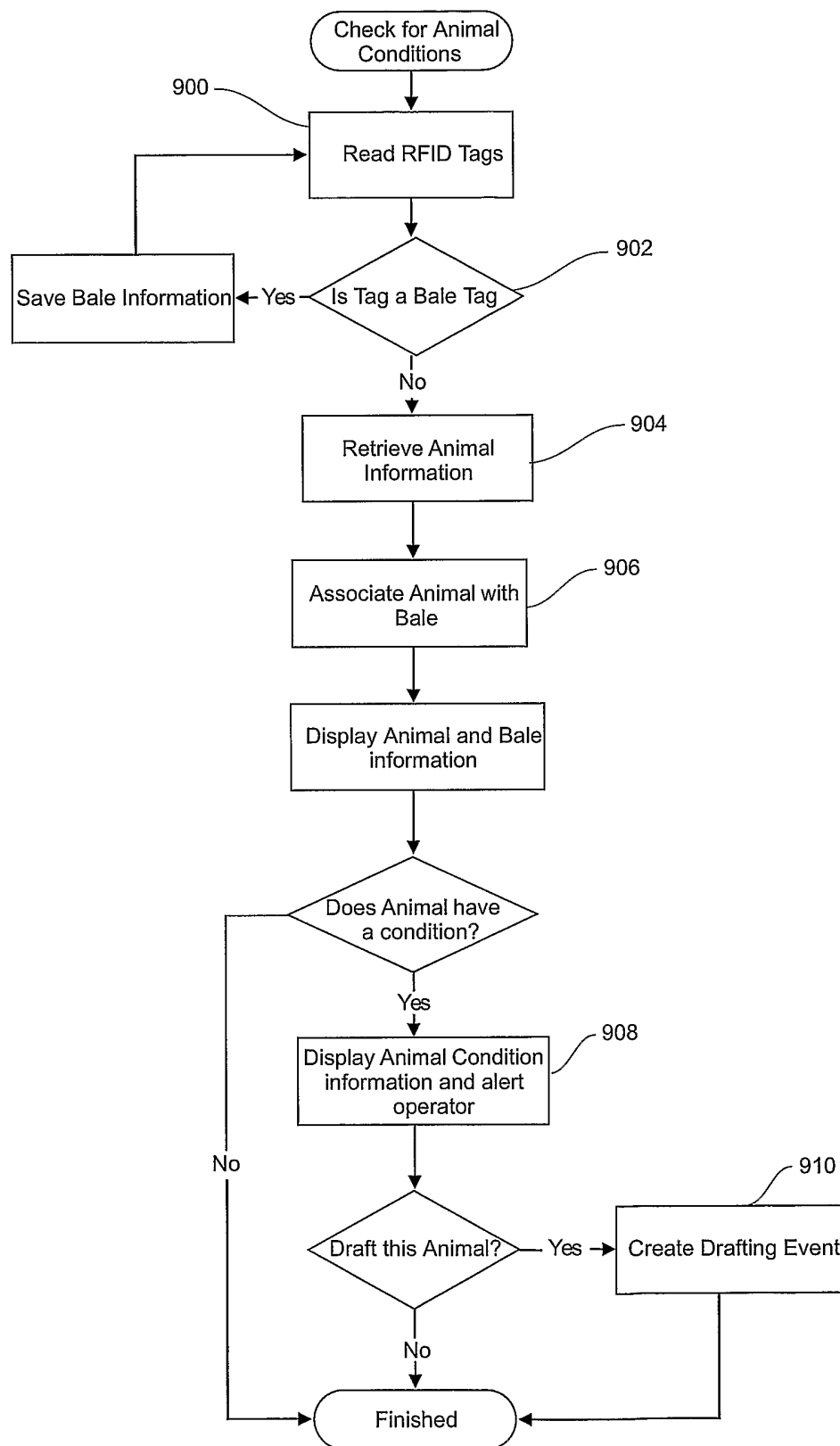
FIGURE 6

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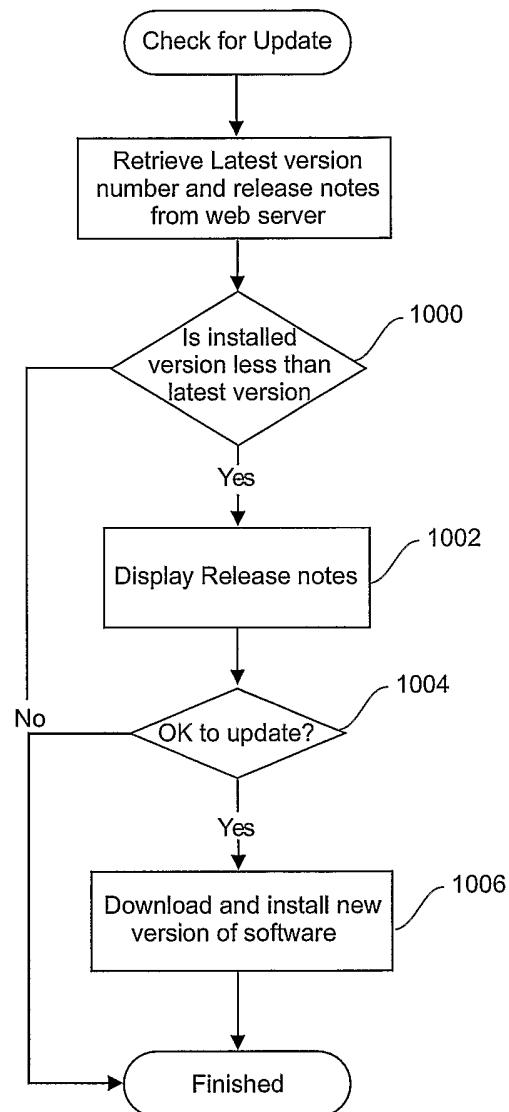
**FIGURE 7**

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**FIGURE 8**

**10/14****FIGURE 9**

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**FIGURE 10**

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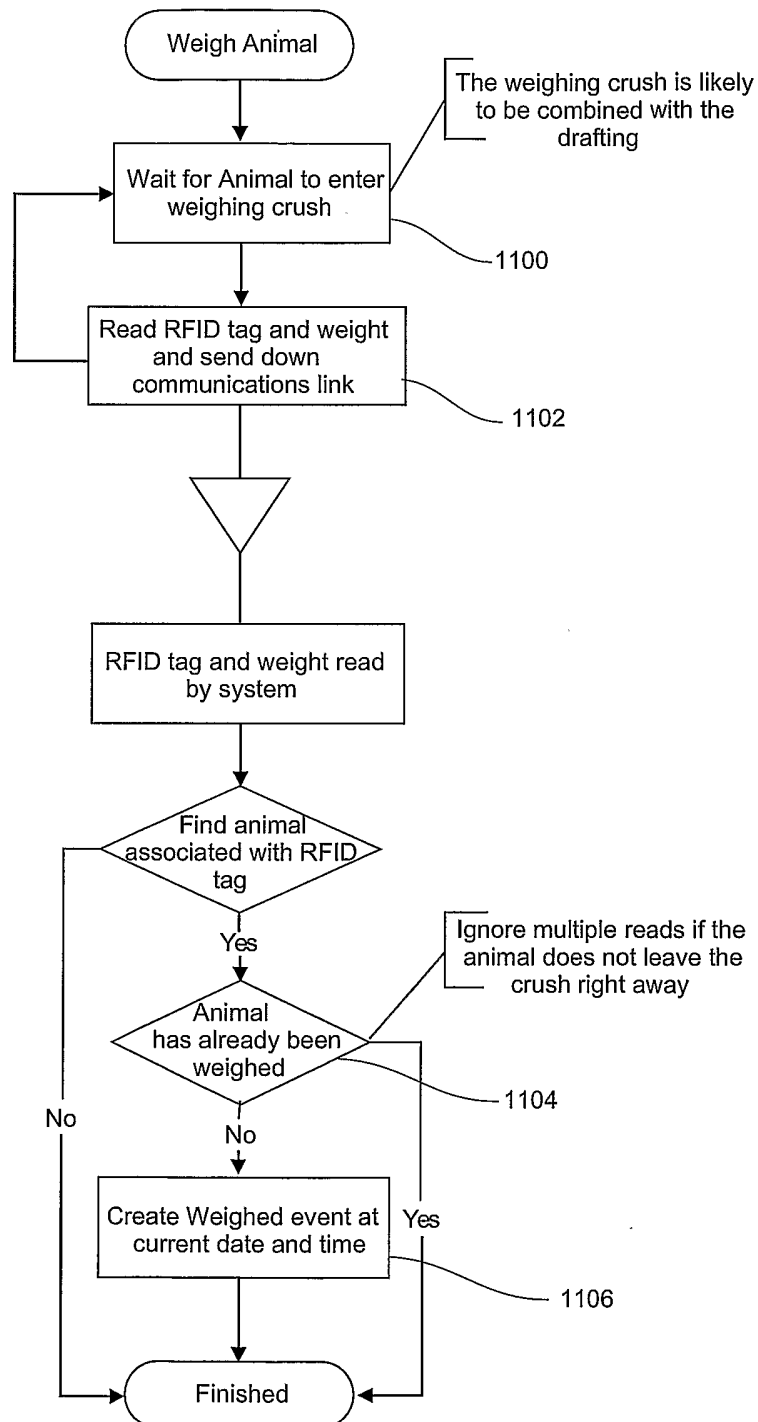


FIGURE 11

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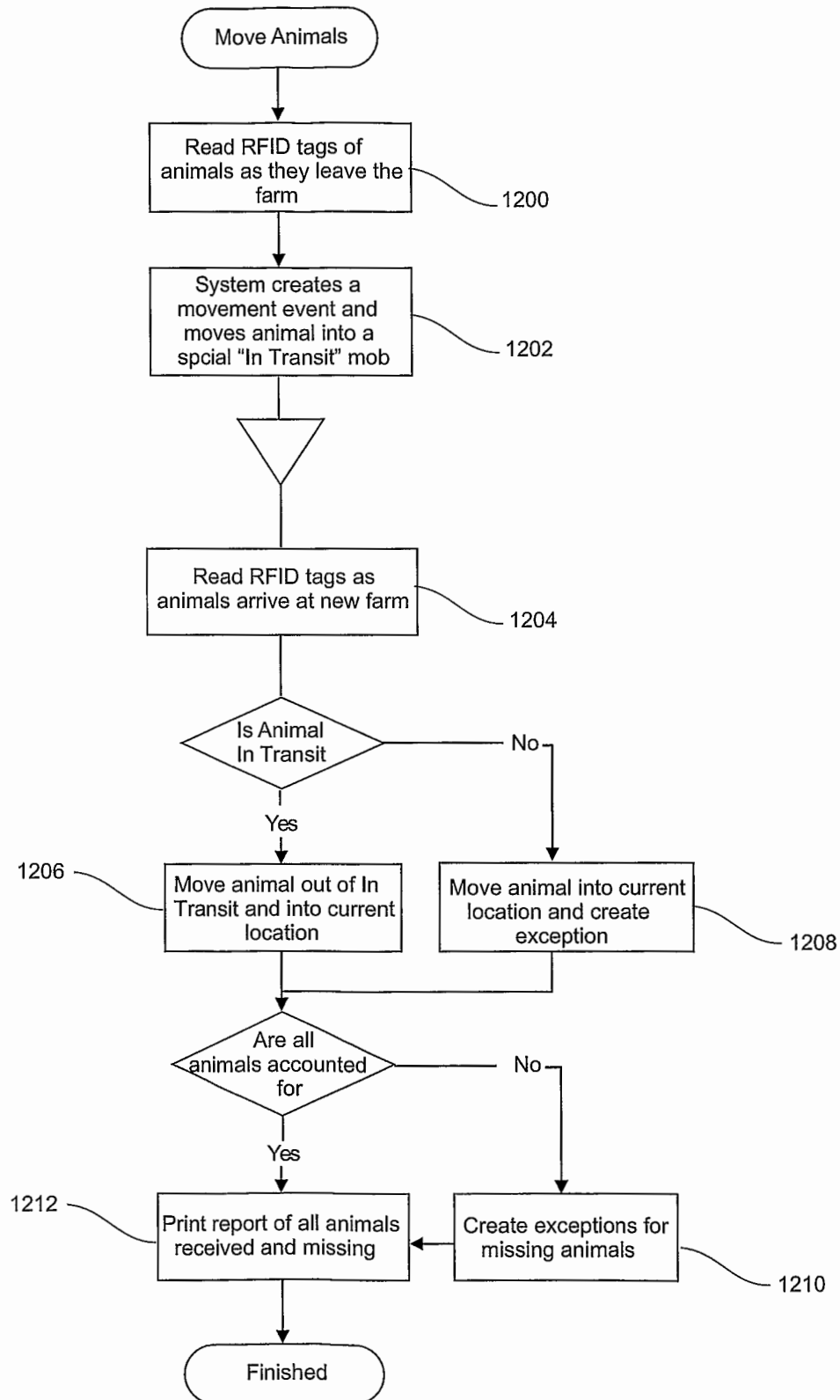
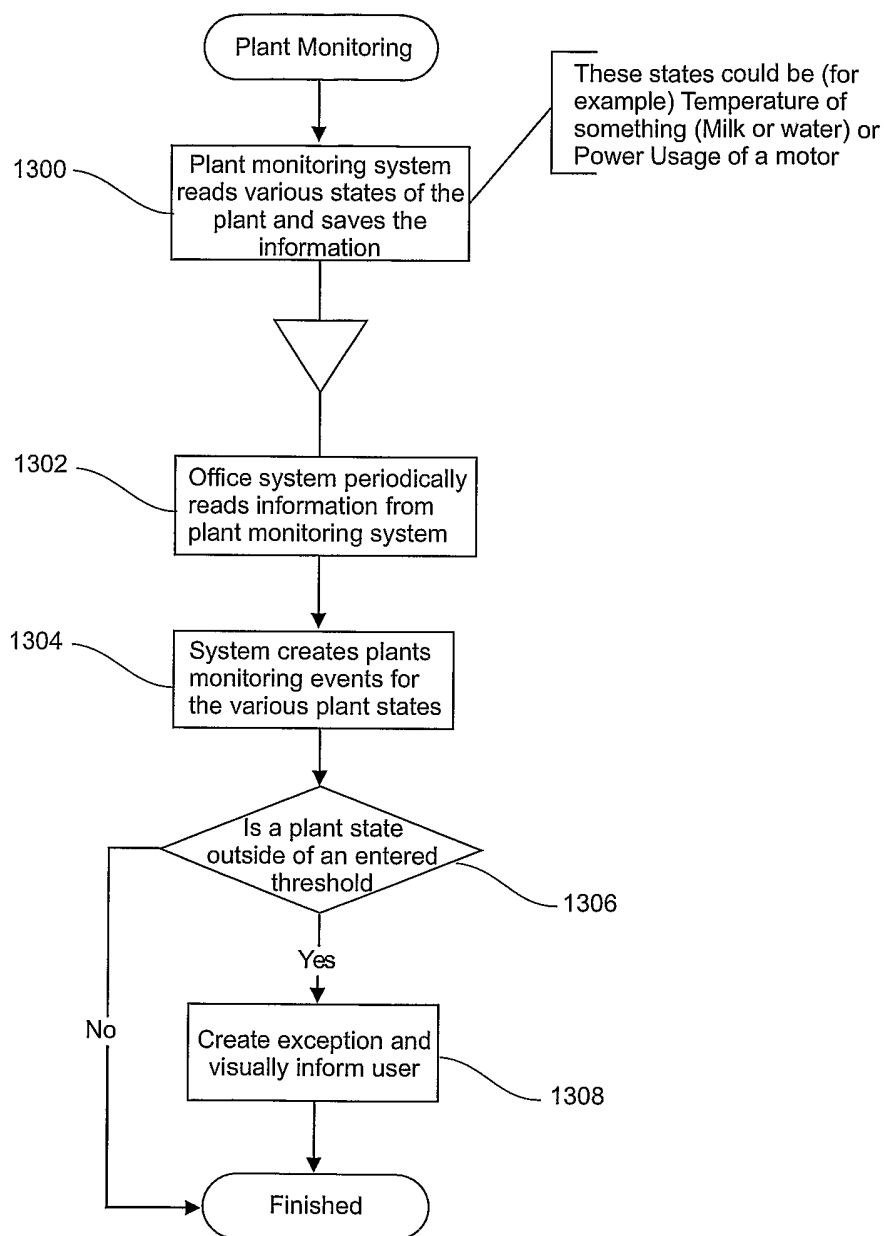


FIGURE 12

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**FIGURE 13**