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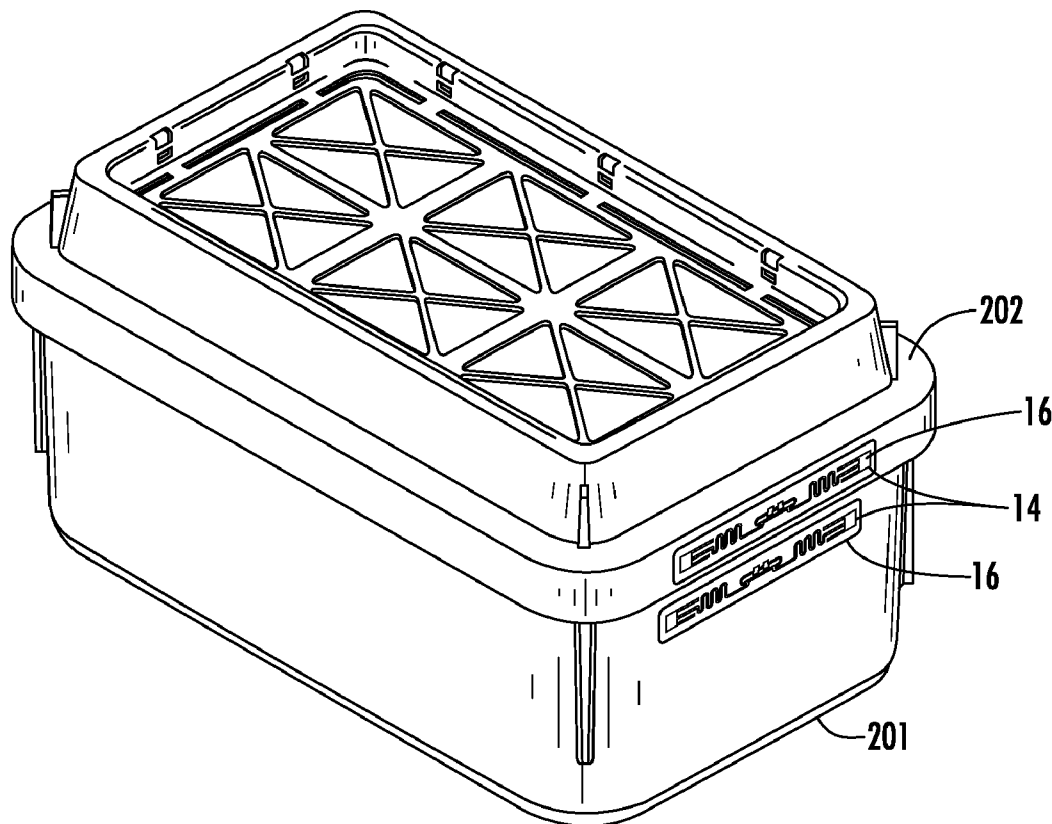
(19) **United States**(12) **Patent Application Publication**
Coiro, SR. et al.(10) **Pub. No.: US 2012/0193415 A1**(43) **Pub. Date: Aug. 2, 2012**(54) **INTEGRATED RFID TAG IN A CARD
HOLDER, CAGE, LID, AND RACK FOR USE
WITH INVENTORYING AND TRACKING OF
CAGE OCCUPANTS AND EQUIPMENT****Publication Classification**(51) **Int. Cl.**
G06Q 90/00 (2006.01)
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A01K 1/03 (2006.01)
(52) **U.S. Cl. 235/385; 119/452**(76) **Inventors:** **Michael A. Coiro, SR.,**
Jacobstown, NJ (US); **Steven J.**
Miller, Allentown, NJ (US); **Tom**
Schupsky, Cream Ridge, NJ (US)(57) **ABSTRACT**

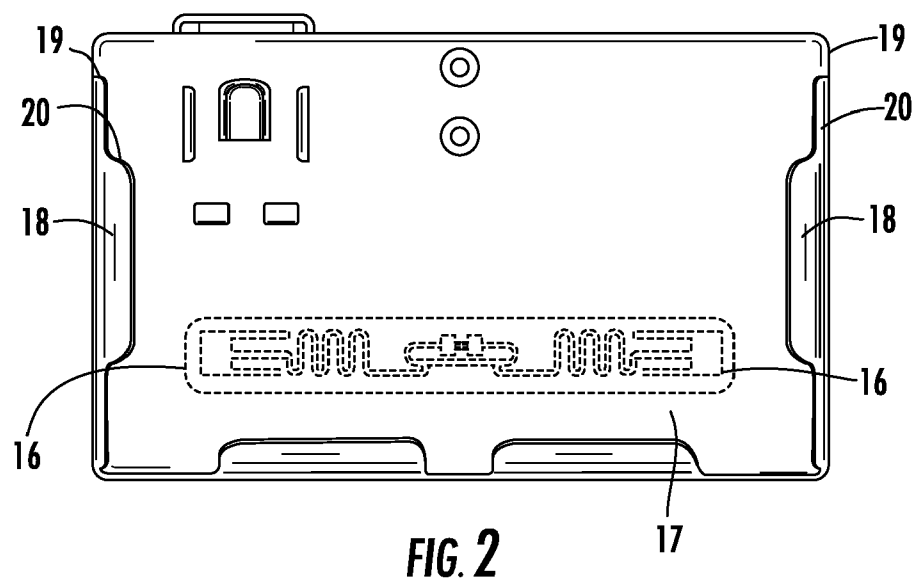
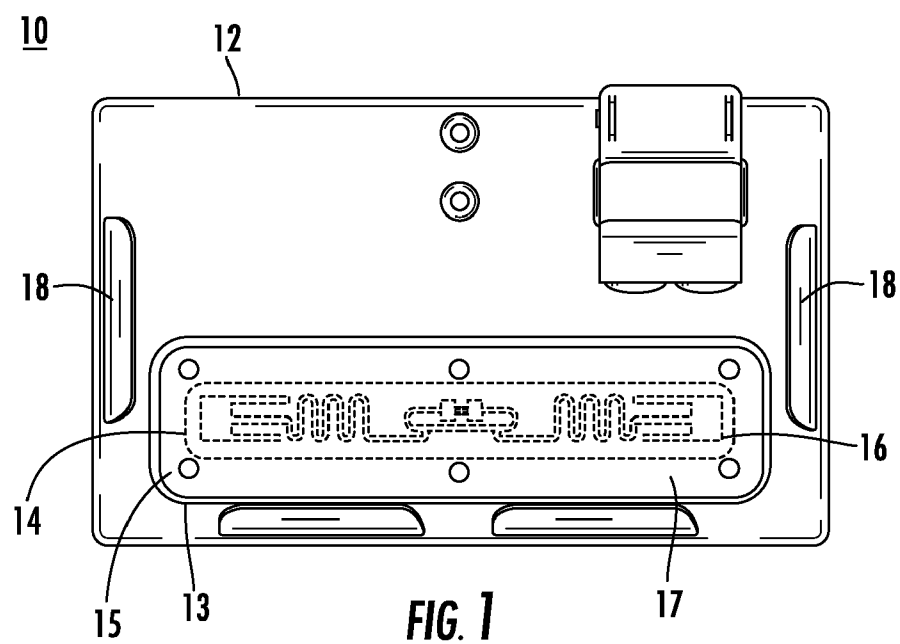
The present invention relates to an integrated RFID card holder, cage, lid or rack and system for collecting census, inventorying, and tracking of animal cages, lids, card holders, racks, and other related equipment. Preferably, the card holder is comprised of an RF transparent material such as plastic. During operation, a RFID reader reads each integrated RFID card holder attached to an animal cage for virtually linking the cage to an animal rack in effect assigning a parking spot to each animal cage within an animal cage rack system. The integrated RFID card holder can be determined to be in a room when the Received Signal Strength Indicator (RSSI) is the highest comparing multiple reads from one or many antennas.

(21) **Appl. No.: 13/429,960**(22) **Filed: Mar. 26, 2012****Related U.S. Application Data**

(62) Division of application No. 12/473,686, filed on May 28, 2009, now Pat. No. 8,161,910.

(60) Provisional application No. 61/056,901, filed on May 29, 2008.





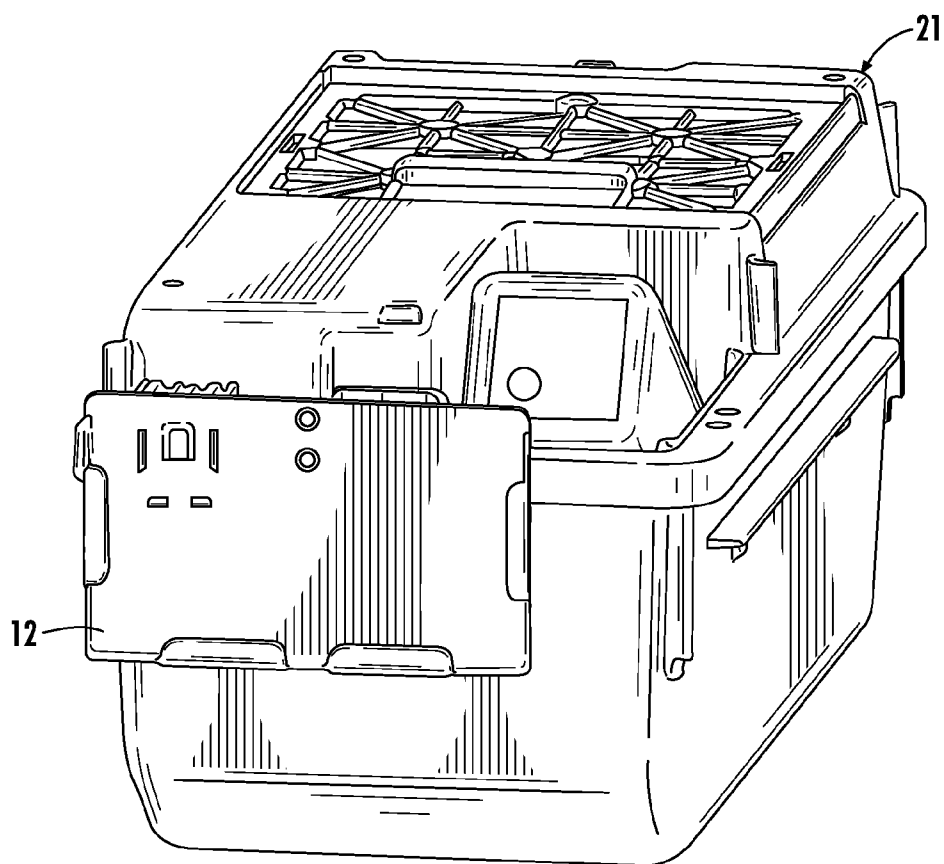
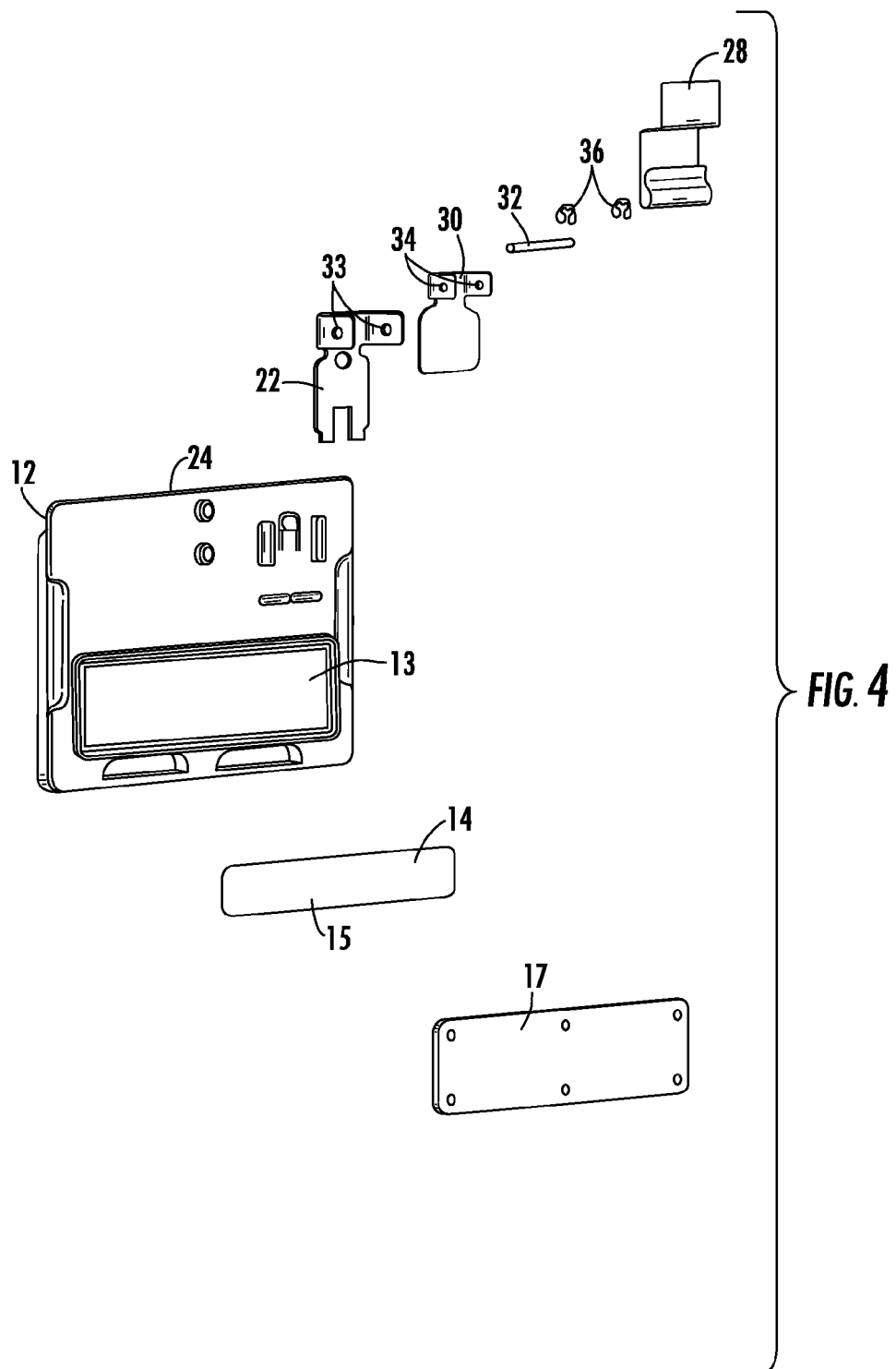
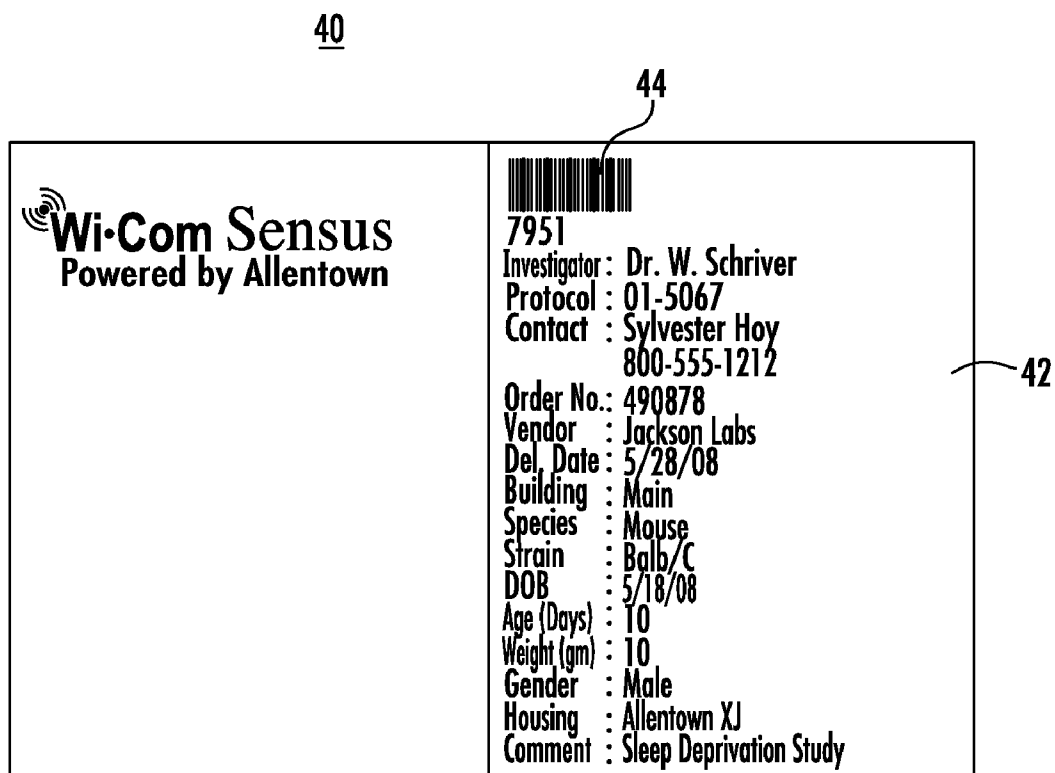


FIG. 3





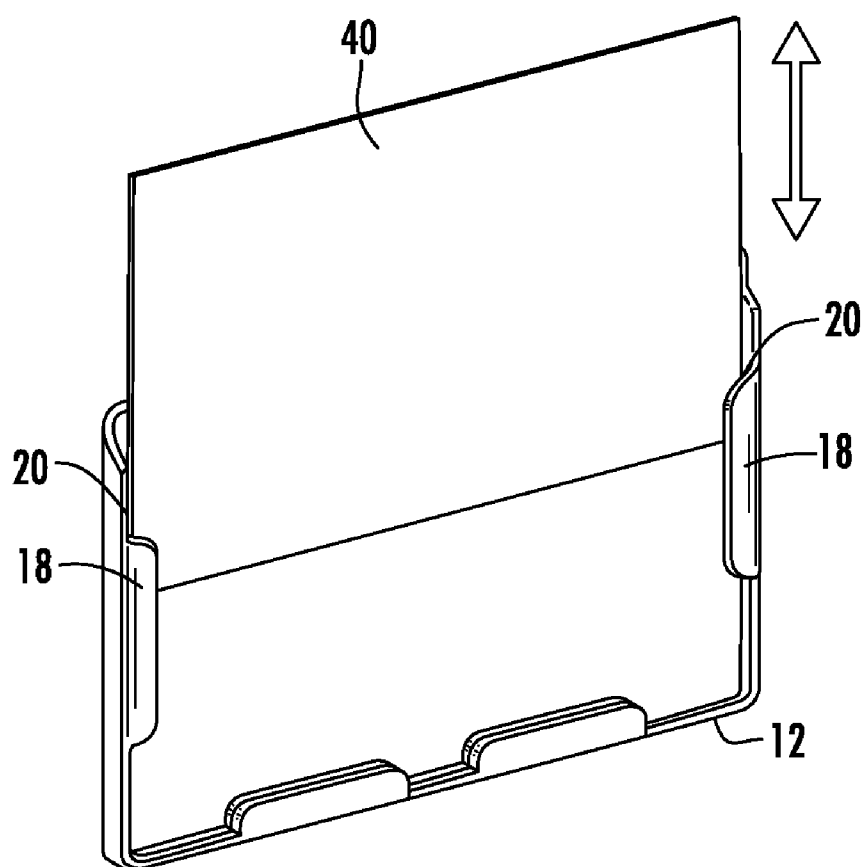
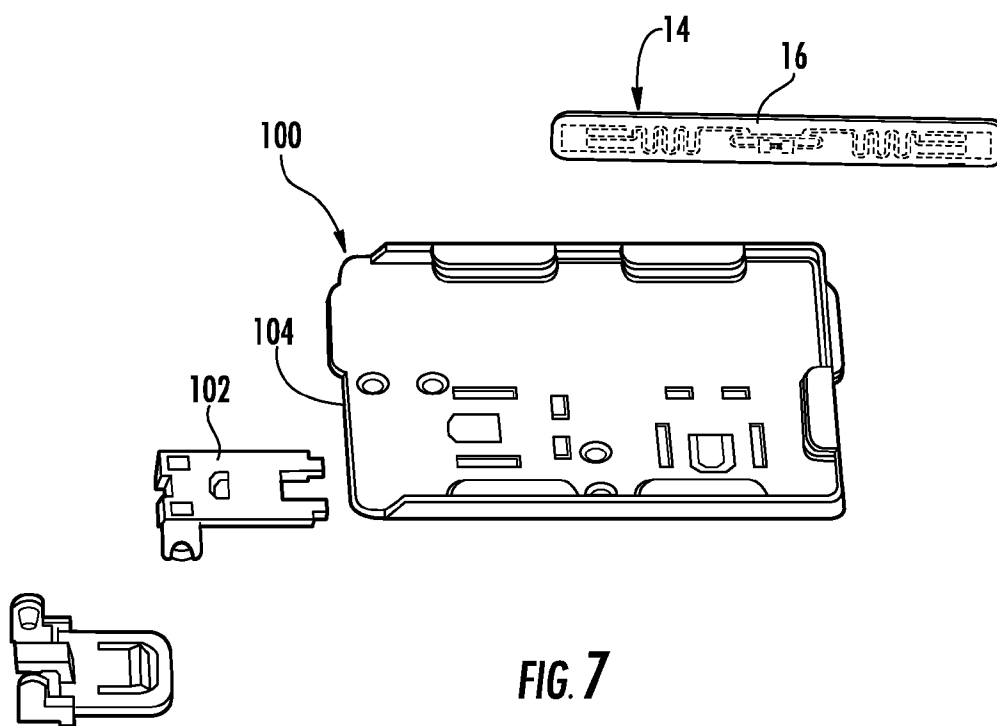


FIG. 6



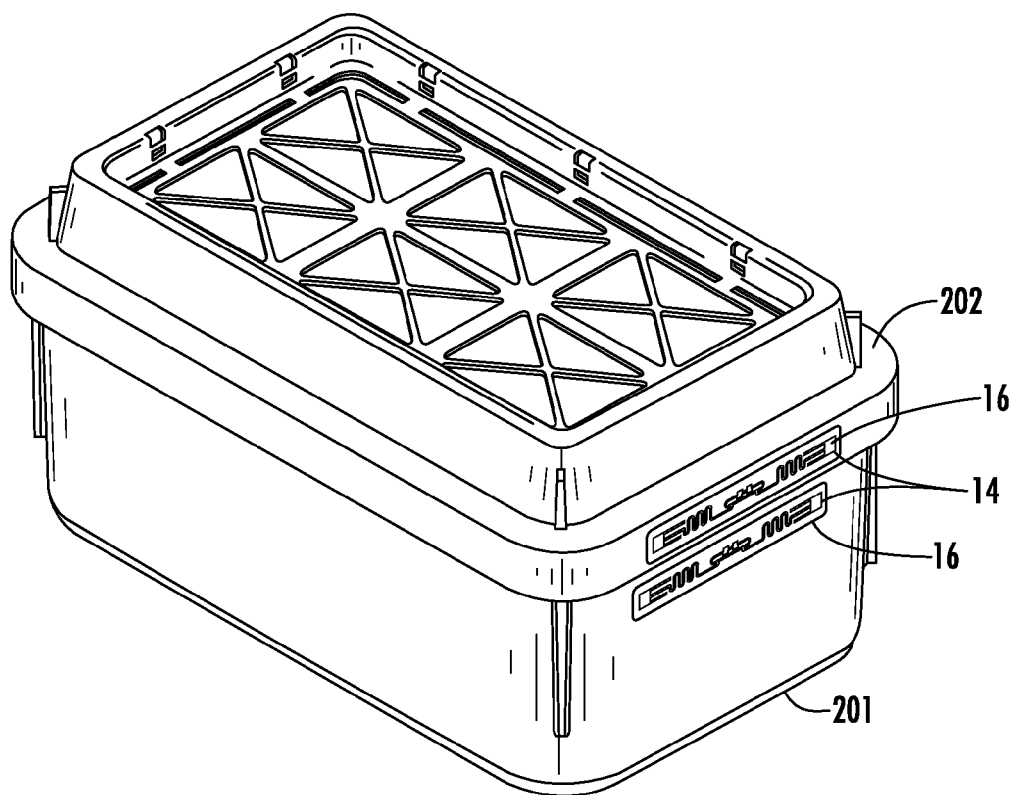


FIG. 8

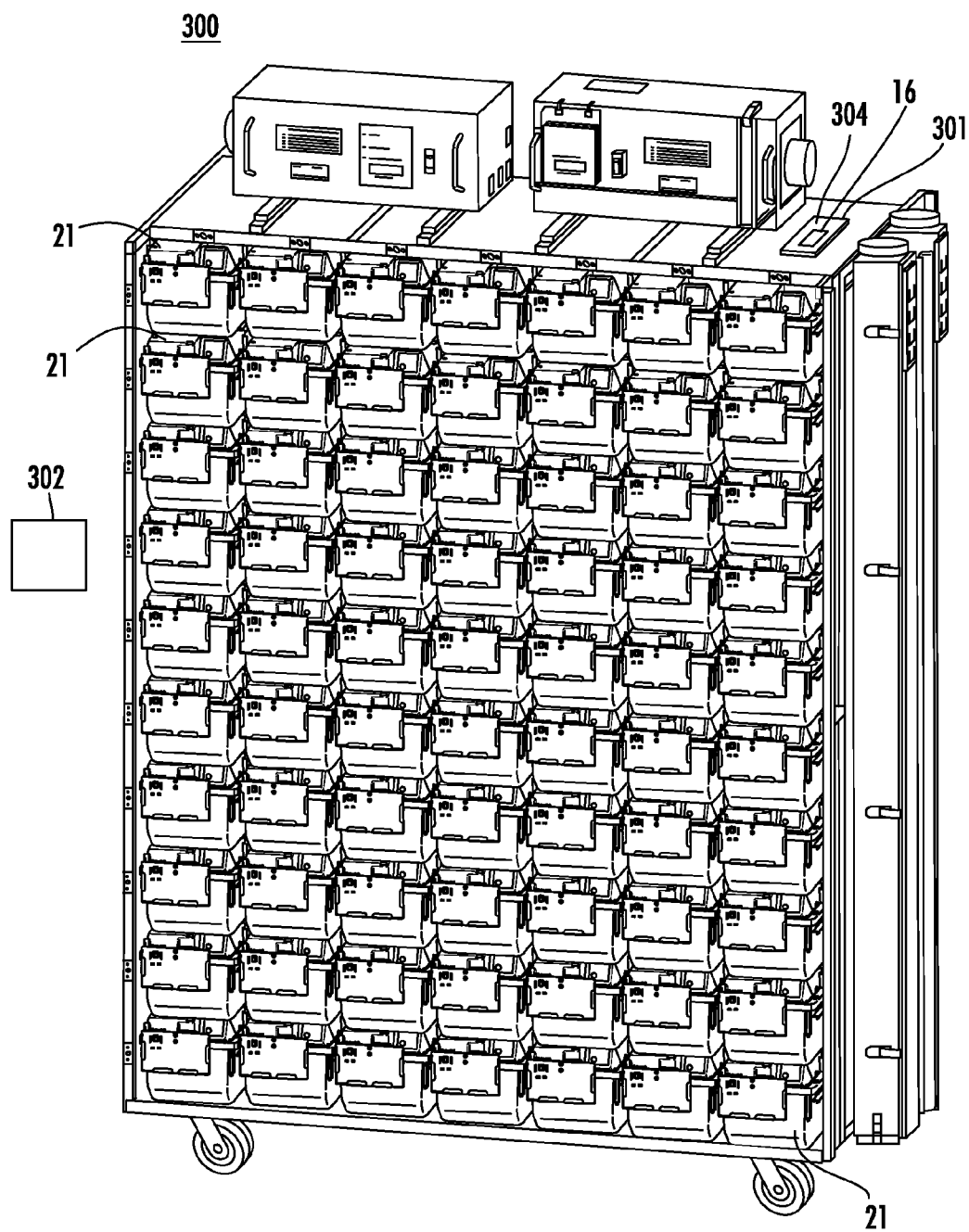


FIG. 9

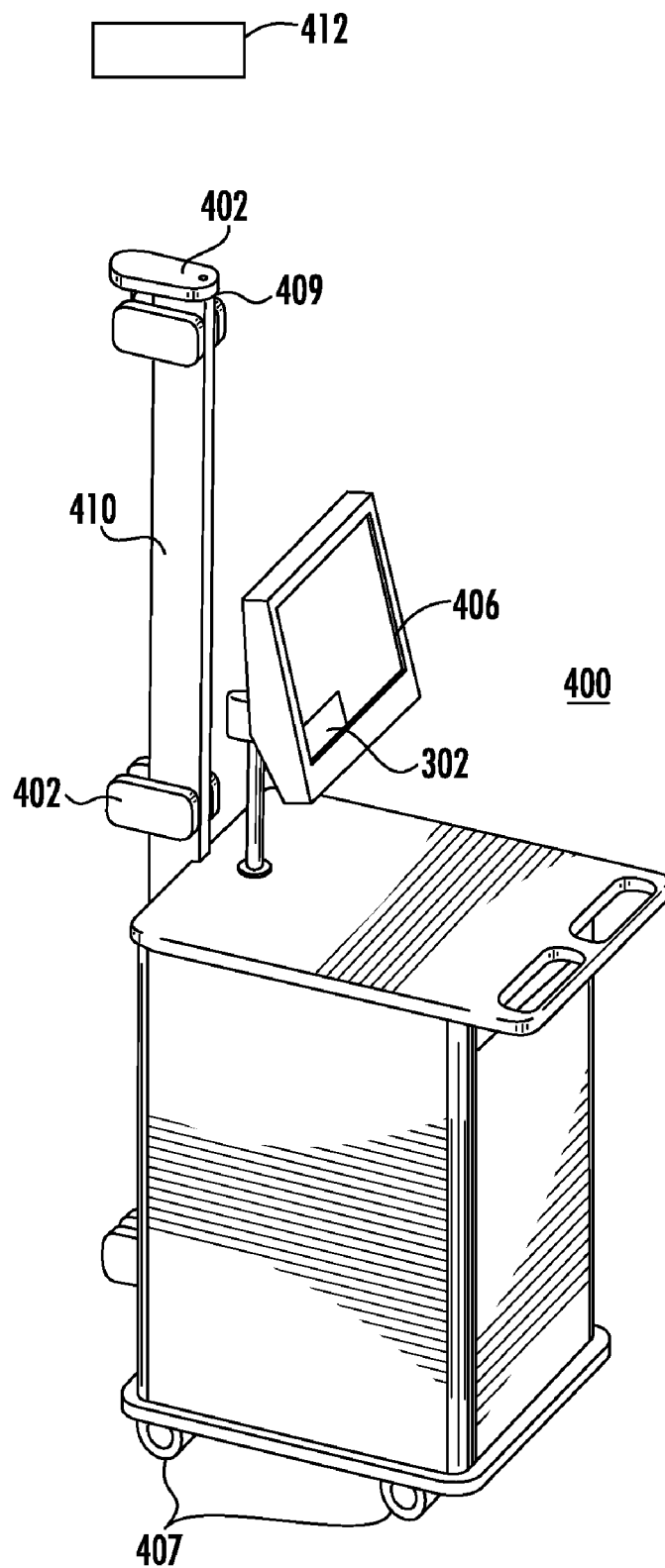


FIG. 10

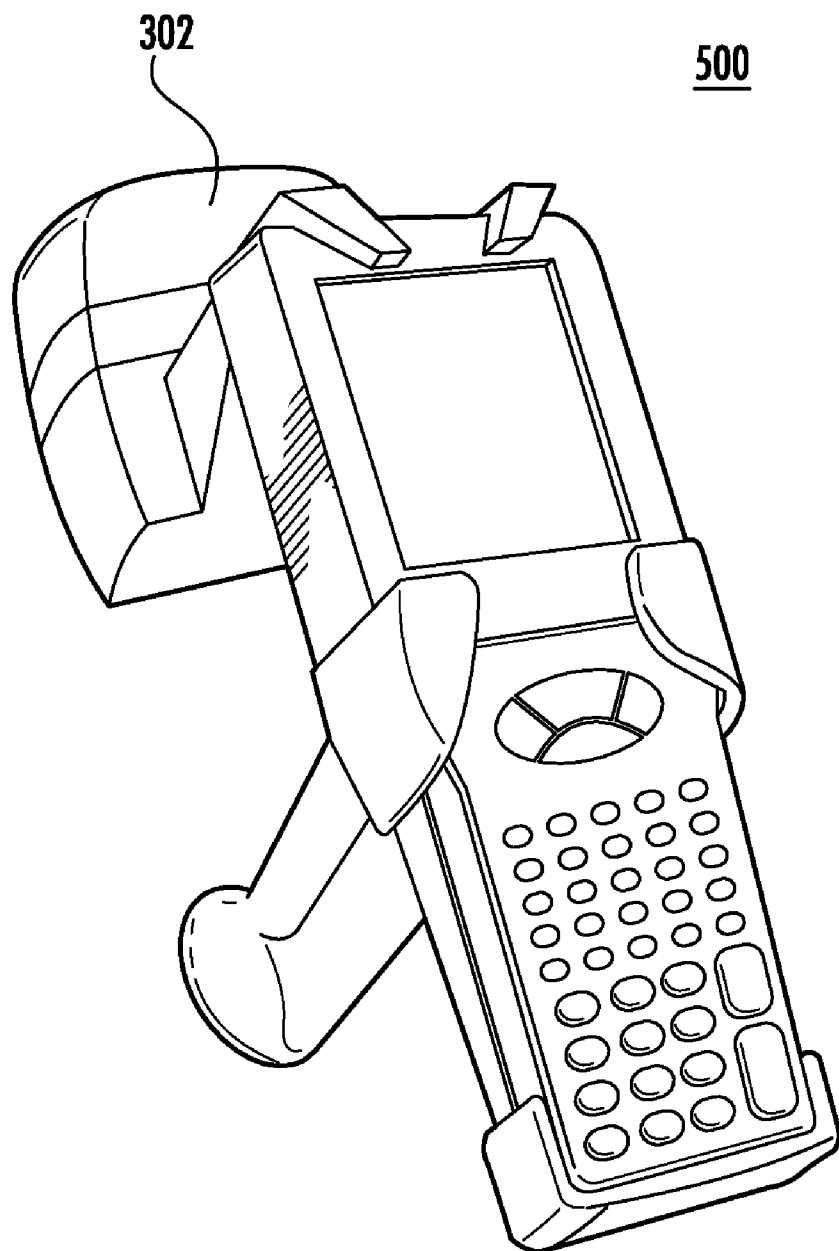


FIG. 11

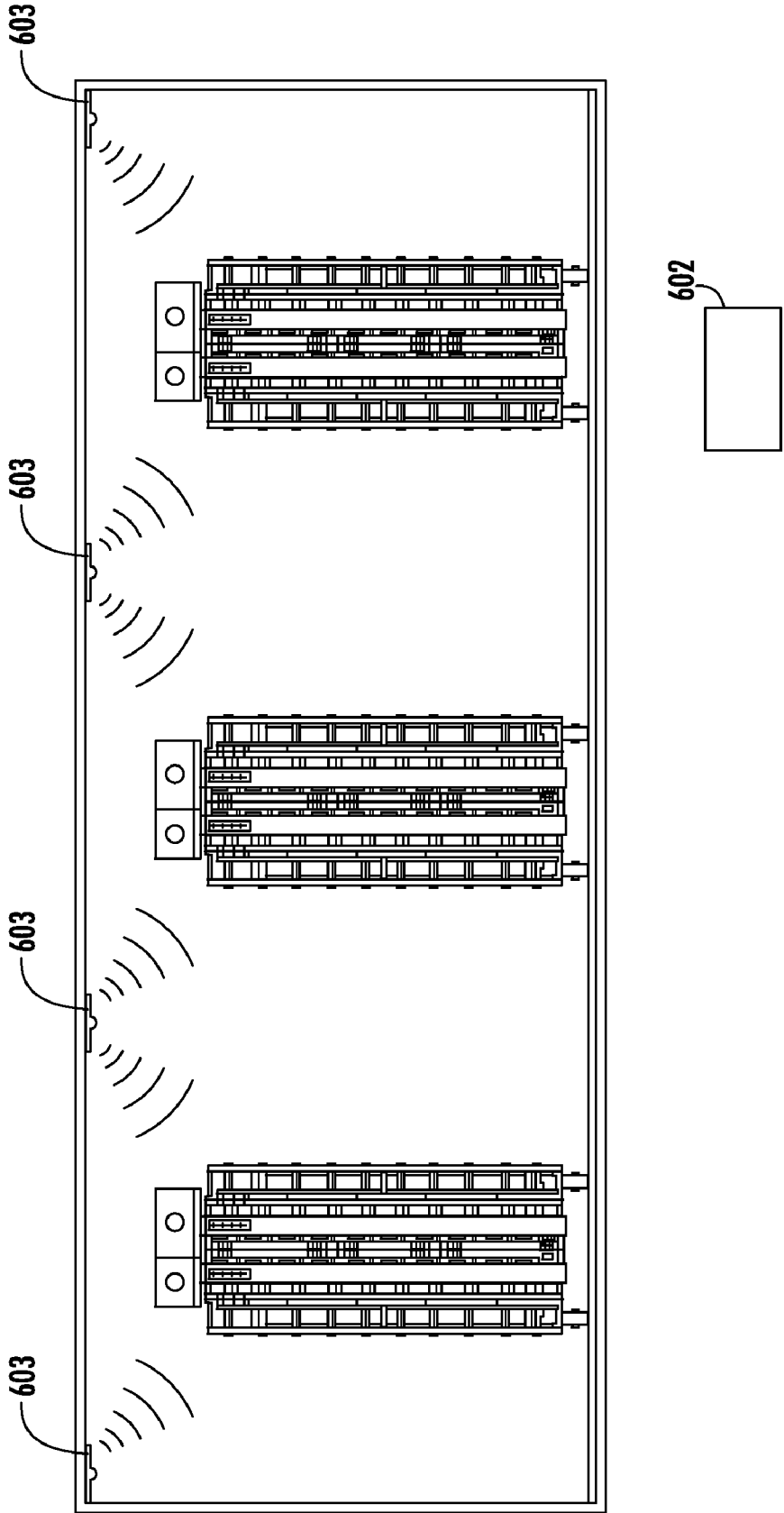


FIG. 12

INTEGRATED RFID TAG IN A CARD HOLDER, CAGE, LID, AND RACK FOR USE WITH INVENTORYING AND TRACKING OF CAGE OCCUPANTS AND EQUIPMENT

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 61/056,901, filed May 29, 2008, the entirety of which is hereby incorporated by reference into this application.

BACKGROUND OF THE INVENTION

[0002] Conventionally, cards identifying research animals have been attached to animal cages in a rack system. A card holder is attached to the animal cage system. The card slides into the card holder. Typically, the card holder is comprised of metal.

[0003] Dyanasys has developed a product referred to as Dyanasys Animal Care Warehouse Management System which attaches a radio frequency identification (RFID) transmitter to a conventional metal card holder. The card can be read up to a range of about 8 to 10 feet.

[0004] U.S. Patent Application Publication No. 2005/0241591 describes an animal cage in which a rear wall has an opening for inserting a monitoring module. The monitoring monitor monitors various conditions of the cage. A radio frequency identification (RFID) tag can be integrated with the monitoring linkage. The RFID tag can be programmed with identification information, such as number of the cage, type of animal, number of animals and type of testing. The tag can be read with a reader to keep track and identify each cage. This patent has the drawback of not including the combination of a card holder and RFID tag with an animal cage. It is desirable to provide an improved integrated RFID card holder and a system operable at a greater range for RFID inventorying and/or tracking of animals, animal cages, and racks

SUMMARY OF THE INVENTION

[0005] The present invention relates to an integrated RFID card holder and system for inventorying and/or tracking animal cages. Preferably, the integrated RFID card holder is manufactured of an RF transparent material, such as a non-metallic material. In one embodiment, a RFID inlay is received in a cavity of the card holder for unencumbering the RFID inlay and allowing a greater range of transmission of the passive RFID signal up to about 25 feet. The cavity can be environmentally sealed to enable repeatable autoclaving, chemical decontamination, such as with vaporized hydrogen peroxide gas, chlorine dioxide gas or wet chemical wipe down, and repeatable washing cycles. Alternatively, the RFID inlay can be integrated into an animal cage or lid of the animal cage or rack of animal cages which are comprised or a portion is comprised of a RF transparent material. In one embodiment, during operation, a RFID reader reads each integrated RFID card holder attached to an animal cage for virtually linking the cage to a database including information of the animal rack, in effect assigning a parking spot to each animal cage within an animal cage rack system. The integrated RFID card holder or RFID inlay integrated into the animal cage or lid of the animal cage or rack of animal cages can be determined to be in a room or a position in a room where the Received Signal Strength Indicator (RSSI) is the highest by

comparing multiple reads from one or many antennas for providing data collection. The pin-pointing of a location of the integrated RFID card holder, cage, lid or rack within a facility can be used for census, inventory, and tracking purposes.

[0006] The invention will be more fully described by reference to the following drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is a rear elevational view of an integrated RFID card holder in accordance with the teaching of the present invention.

[0008] FIG. 2 is a front elevational view of the integrated RFID card holder.

[0009] FIG. 3 is a front and side elevational view of the integrated RFID card holder attached to the animal cage.

[0010] FIG. 4 is a schematic diagram of assembly of the integrated RFID card holder.

[0011] FIG. 5 is a schematic diagram of an animal information card.

[0012] FIG. 6 is a schematic diagram of the animal information card being inserted in the integrated RFID card holder

[0013] FIG. 7 is a schematic diagram of an alternate embodiment of an assembly of the integrated RFID inlay assembled directly to a RF transparent card holder.

[0014] FIG. 8 is an alternate embodiment of an integrated RFID inlay or RFID integrated circuit (IC) in an animal cage or lid of the animal cage.

[0015] FIG. 9 is a schematic diagram of a rack system for inventorying or tracking animal cages.

[0016] FIG. 10 is a schematic diagram of an inventory cart including a RFID reader.

[0017] FIG. 11 is a schematic diagram of a handheld RFID reader.

[0018] FIG. 12 is a schematic diagram of an embodiment of a plurality of fixed positioned antennas associated within a room.

DETAILED DESCRIPTION

[0019] Reference will now be made in greater detail to a preferred embodiment of the invention, an example of which is illustrated in the accompanying drawings. Wherever possible, the same reference numerals will be used throughout the drawings and the description to refer to the same or like parts.

[0020] FIGS. 1-4 illustrate an integrated RFID card holder 10 in accordance with the teachings of the present invention. Card holder 12 includes cavity 13 for receiving RFID inlay 14. Cavity 13 has a shape substantially matching the shape of RFID inlay 14. In one embodiment, RFID inlay 14 can comprise RFID support 15 having the shape substantially matching the shape of cavity 13 and RFID tag 16. For example, RFID tag 16 can be applied as a RFID label or with an adhesive to RFID support 15. Alternatively, RFID tag 16 can be integrated with RFID support 15. Cover 17 can be assembled into place over cavity 13 for retaining RFID inlay 14 within cavity 13. For example cover 17 can be environmentally sealed to cavity 13 by using one or more of the following, sonic welding of similar materials, snap fit of cover 17 and cavity 13 and use of weather seal gasket 11, insert molding of RFID inlay 14 and an adhesive applied between cavity 13 and RFID inlay 14. Preferably, card holder

12 is comprised of a RF transparent material such a non-metallic material. For example, RF transparent material can be rigid plastic or ceramic.

[0021] A plurality of protrusions **18** are positioned at edges **19** of card holder **12**. Slot **20** is positioned within each protrusion **18**. Animal cage information card **40** can slide within slot **20** and be retained by protrusions **18**, as shown in FIGS. **5** and **6**. For example, the card can be a 3×4 or 3×5 card.

[0022] As shown in FIG. **3**, integrated RFID card holder **10** is attached to animal cage **21** and moves with animal cage **21** independent of placement of animal cage **21** on a rack for animal cages. In this embodiment, integrated RFID card holder **10** is used in a vertical position. Clip holder **22** attaches to rear surface **24** of card holder **12** for removably or permanently attaching integrated RFID card holder **10** to animal cage **21**, as shown in FIGS. **3** and **4**. Clip **28** is attached to clip holder **22**. For example, clip **28** can be attached using mounting bracket **30**. Mounting bracket **30** is attached to clip holder **22** using rod **32** received within apertures **33** of clip holder **22** and apertures **34** of mounting bracket **30**. E-ring **36** retains rod **32**. Clip **28** can be attached to animal cage **21**.

[0023] Animal cage information card **40** includes indicia region **42**, as shown in FIG. **5**. Indicia region **42** includes information directed to the animal. For example, the information can include investigator, protocol, contact, vendor, vendor breeding area, number of animals, species, strain, age, date of birth, sex and room assignment. Bar code **44** is associated with card **40**. Bar code **44** provides a unique identification number.

[0024] In an alternate embodiment, RFID inlay **14** comprises RFID tag **16** which is attached directly on a RF transparent, integrated RFID card holder **100** without using cavity **13**, as shown in FIG. **7**. For example, RFID tag **16** can be applied as a RFID label with an adhesive or insert molded to integrated RFID card holder **100**. In this embodiment, integrated card holder **100** can be used in a horizontal or vertical position. Clip holder **102** attaches to rear surface **104** of integrated RFID card holder **100** for removably or permanently attaching integrated RFID card holder **100** to animal cage. Clip **108** is attached to clip holder **102**. Clip **108** is attached to animal cage **21** (not shown).

[0025] In an alternate embodiment, RFID inlay **14** can be attached or integrated into animal cage **21** or lid **202** as shown in FIG. **8**. For example, RFID tag **16** can be applied as a RFID label or with an adhesive to animal cage **201** or lid **202**. Alternatively, RFID tag **16** can be insert molded.

[0026] Animal cages **21** including RFID inlay **14** in any of the embodiments of integrated RFID card holder **10**, integrated RFID card holder **100**, attached to animal cage **21** or lid **202** can be used in a rack system for inventorying or tracking animal cages **300**, as shown in FIG. **9**. RFID reader **302** reads an identification of RFID inlay **14** or each RFID inlay **14** positioned within rack housing animal cages **301**. For example, RFID reader **302** can read RFID inlay **14** at a distance up to 20 feet to 25 feet. RFID inlay **305** can also be associated with rack housing animal cages **301**. RFID inlay **304** can include RFID tag **16**. Alternatively, RFID inlay **304** can include an active RFID tag. In one embodiment, RFID inlay **304** provides a housing for RFID tag **16**.

[0027] RFID reader **302** can be associated with inventory cart **400**, as shown in FIG. **10**. Inventory cart **400** includes antennas **402** associated with RFID reader **302**. Inventory cart **400** can also include computer device **406**. Inventory cart **400** moves adjacent to the rack housing animal cages (not shown).

Inventory cart **400** includes wheels **407** for allowing inventory cart **400** to be rolled adjacent the rack housing animal cages. During operation, RFID reader **302** logs an identification from the RFID tag associated with each cage having an associated integrated RFID card holder **10**, integrated RFID card holder **100**, attached to animal cage **21** or lid **202** in order to interact with a database stored in computer device **406** and effectively virtually assign a parking spot to each particular animal cage in an animal cage rack system. The data from integrated RFID card holder **10**, integrated RFID card holder **100**, attached to animal cage **21** or lid **202** can be stored in the data base or memory of computer device **406** and can be used for pin-pointing the location of associated RFID card holder **10**, integrated RFID card holder **100**, attached to animal cage **21** or lid **202** within a facility for census, inventory and tracking purposes. In one embodiment, Received Signal Strength Indicator (RSSI) at RFID antenna/reader **402** mounted at top **409** of inventory mast **410** can be used to determine location, such as within a room or a particular room, which contains integrated RFID card holder **10**, integrated RFID card holder **100**, attached to animal cage **21** or lid **202** attached to an animal cage. Integrated RFID card holder **10**, integrated RFID card holder **100**, attached to animal cage **21** or lid **202** is determined to be in a position of a room or room where the RSSI is the highest based on one or more RFID location tags **412** located within the room, such as on the ceiling of the room.

[0028] In an alternate embodiment, RFID reader **302** is included in handheld device **500**, as shown in FIG. **11**. Hand held device **500** can be waved in front of the rack housing animal cages (not shown).

[0029] Alternatively, one or more RFID readers **602** can be associated with a room containing one or more racks housing animal cages **301**, as shown in FIG. **12**. In this embodiment, RFID reader **602** can be a LAN based RFID reader with fixed positioned antennas **603**. In one embodiment, Received Signal Strength Indicator (RSSI) at RFID reader **602** from positioned antennas **603** can be used to determine location, such as within a room or a particular room which contains integrated RFID card holder **10**, integrated RFID card holder **100**, attached to animal cage **21** or lid **202** attached to an animal cage. Integrated RFID card holder **10**, integrated RFID card holder **100**, attached to animal cage **21** or lid **202** is determined to be in a position of a room or room where the RSSI is the highest.

[0030] It is to be understood that the above-described embodiments are illustrative of only a few of the many possible specific embodiments, which can represent applications of the principles of the invention. Numerous and varied other arrangements can be readily devised in accordance with these principles by those skilled in the art without departing from the spirit and scope of the invention.

1.-10. (canceled)

11. An integrated RFID animal cage comprising:

an animal cage,
a RFID inlay attached or integrated with said animal cage or a lid of said animal cage;
wherein said animal cage is comprised of a RF transparent material.

12. The integrated RFID card holder of claim **11** wherein said RFID inlay comprises a tag, said tag being applied to said animal cage as a RFID label or with an adhesive.

13. A system for inventorying or tracking one or more animal cages, lids or racks of animal cages comprising:

a RFID inlay attached or integrated with said animal cage or a lid of said animal cage or a rack of said animal cages; a RFID reader for reading an identification from said RFID inlay; and

inventorying or tracking means for receiving said identification from said RFID reader and providing inventory or tracking information.

14. The system of claim **13** further comprising a card holder adapted for receiving a card.

15. The system of claim **14** wherein said card holder includes a cavity;

said RFID inlay including a RFID tag, said RFID inlay being received in said cavity of said card holder;

a cover coupled to said cavity for retaining said RFID inlay within said cavity, thereby attaching said RFID inlay to said card holder.

16. The system of claim **14** wherein said card holder is comprised of a RF transparent material.

17. The system of claim **14** wherein said RFID inlay comprising an RFID tag, said RFID tag being applied to said card holder as a RFID label or with an adhesive.

18. The system of claim **14** wherein said card including an indicia region adapted for receiving information directed to an animal within the animal cage.

19. The system of claim **13** further comprising an inventory cart, said inventory cart being associated with said RFID reader.

20. The system of claim **13** wherein said inventory cart being associated with said inventorying or tracking means and further comprising:

means for storing said identification in a database.

21. The system of claim **13** wherein said RFID reader is a LAN based RFID reader with fixed position antennas, said inventorying means further comprising means for determining received signal strength of said identification from said RFID reader for detecting said location of said animal cage.

22. The system of claim **13** wherein said RFID reader is included in a hand held device.

23. The system of claim **13** wherein said one or more animal cages, or lids, or racks are comprised of a RF transparent material, said RFID inlay comprising an RFID tag, said RFID tag being applied to said one or more animal cages or lids as a RFID label or with an adhesive.

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