

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VUSIONGROUP SA,
Petitioner

v.

HANSHOW TECHNOLOGY CO., LTD.,
Patent Owner.

IPR2024-00857

U.S. Patent No. 11,540,216

**DECLARATION OF ANDREW WOLFE, PH.D.
IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 11,540,216**

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I, Andrew Wolfe, declare as follows:

I. INTRODUCTION

1. I have been retained by VusionGroup SA (“VusionGroup” or “Petitioner”) as an independent expert consultant in this proceeding before the United States Patent and Trademark Office (“PTO”).

2. I am being compensated at a rate of \$650/hour for my services in this proceeding, which is my regular and customary rate.

3. My compensation is in no way contingent on the nature of my findings, the presentation of my findings in testimony, or the outcome of this or any other proceeding. I have no other interest in this proceeding.

4. I have been asked to consider whether certain references disclose or suggest the features recited in the claims of U.S. Patent No. 11,540,216 (“the ’216 patent”) (Ex. 1001).¹ My opinions are set forth below.

II. BACKGROUND AND QUALIFICATIONS

5. I am an independent consultant. All of my opinions stated in this declaration are based on my own personal knowledge and professional judgment. In forming my opinions, I have relied on my education, experience, and knowledge

¹ Where appropriate, I refer to exhibits I understand will be attached to the petition for *inter partes* review of the ’216 patent (the “Petition”).

regarding electrical engineering, computer science, audio engineering, user interface design, and experience with consumer product design.

6. I am over 18 years of age and, if I am called upon to do so, I would be competent to testify as to the matters set forth herein. A copy of my current curriculum vitae (“CV”), which details my education and professional and academic experience, as well as a list of all publications I have authored in the past ten years, is included as Ex. 1004 in this proceeding. The following provides an overview of some of my experience that is relevant to the matters set forth in this declaration.

A. Relevant Academic Experience

7. In 1985, I earned the B.S.E.E. degree in Electrical Engineering and Computer Science from the Johns Hopkins University. In 1987, I received the M.S. degree in Electrical and Computer Engineering from Carnegie Mellon University and in 1992, I received the Ph.D. degree in Computer Engineering from Carnegie Mellon University. My doctoral dissertation proposed a new approach for the architecture of a computer processor.

8. I have taught at some of the world’s leading institutions in the fields of processor technology, computer systems, consumer electronics, software, design tools, data security, cryptography and intellectual property issues. These institutions include Stanford University, Princeton University, Carnegie Mellon University, and Santa Clara University.

9. From 1991 through 1997, I served on the Faculty of Princeton University as an Assistant Professor of Electrical Engineering. At Princeton, I taught undergraduate and graduate-level courses in Computer Architecture, Advanced Computer Architecture, Display Technology, and Microprocessor Systems, and conducted sponsored research in the area of computer systems and related topics. From 1999 through 2002, I taught a Computer Architecture course to both undergraduate and graduate students at Stanford University multiple times as a Consulting Professor. At Princeton, I received several teaching awards, both from students and from the School of Engineering. I have also taught advanced microprocessor architecture to industry professionals in IEEE and ACM sponsored seminars. I am currently a lecturer at Santa Clara University teaching courses on Microprocessor Systems, Real-time Embedded Systems, Advanced Logic Design, System Prototyping, Product Development, and Mechatronics. In my classes, I teach electrical engineers, mechanical engineers, and computer engineers about various communications systems related to microprocessor systems and about power management.

10. I have published more than fifty peer-reviewed papers in computer architecture and computer systems and IC (integrated circuit) design. My contributions in the areas of low-power systems and power management have been

widely recognized. My CV lists all publications that I have authored in the previous 10 years.

11. I have also chaired IEEE and ACM conferences in microarchitecture and IC design and served as an associate editor for IEEE and ACM journals. I served on the IEEE Computer Society Awards committee. I am an IEEE Fellow, and IEEE Computer Society Distinguished Contributor, and a Member of ACM. My elevation to IEEE Fellow was based on for contributions in hardware code compression of embedded software, power consumption analysis, and optimization. I am a named inventor on at least fifty-seven U.S. patents and thirty-seven foreign patents including patents related to power management.

12. I have been the invited keynote speaker at the ACM/IEEE International Symposium on Microarchitecture and at the International Conference on Multimedia. I have also been an invited speaker on various aspects of technology or the PC industry at numerous industry events including the Intel Developer's Forum, Microsoft Windows Hardware Engineering Conference, Microprocessor Forum, Embedded Systems Conference, Comdex, and Consumer Electronics Show as well as at the Harvard Business School and the University of Illinois Law School. I have been interviewed on subjects related to technology and the electronics industry by publications such as the Wall Street Journal, New York Times, LA Times, Time, Newsweek, Forbes, and Fortune as well as CNN, NPR, and the BBC. I have also

spoken at dozens of universities including MIT, Stanford, University of Texas, Carnegie Mellon, UCLA, University of Michigan, Rice University, and Duke University.

B. Relevant Professional Experience

13. I am the founder and sole employee of Wolfe Consulting. Through Wolfe Consulting, I provide technical and business analytics to businesses on processor technology, computer systems, consumer electronics, software, design tools, data security, cryptography and intellectual property issues. I have more than thirty years' experience developing products, researching, consulting, and teaching in those fields. In that time, I have worked as a computer architect, computer system designer, and as an executive in the PC and electronics business.

14. I have more than 35 years of experience as a computer architect, computer system designer, personal computer graphics designer, educator, and executive in the electronics industry.

15. In 1983, I began designing touch sensors, microprocessor-based computer systems, and I/O (input/output) cards for personal computers as a senior design engineer for Touch Technology, Inc. During the course of my design projects with Touch Technology, I designed I/O cards for PC-compatible computer systems, including the IBM PC-AT, to interface with interactive touch-based computer terminals that I designed for use in public information systems. I continued

designing and developing related technology as a consultant to the Carroll Touch division of AMP, Inc., where in 1986 I designed one of the first custom touch-screen integrated circuits. I designed the touch/pen input system for the Linus WriteTop, which many believe to be the first commercial tablet computer.

16. From 1986 through 1987, I designed and built a high-performance computer system as a student at Carnegie Mellon University. From 1986 through early 1988, I also developed the curriculum, and supervised the teaching laboratory, for processor design courses.

17. In the latter part of 1989, I worked as a senior design engineer for ESL-TRW Advanced Technology Division. While at ESL-TRW, I designed and built a bus interface and memory controller for a workstation-based computer system, and also worked on the design of a multiprocessor system.

18. At the end of 1989, I (along with some partners) reacquired the rights to the technology I had developed at Touch Technology and at AMP, and founded The Graphics Technology Company. Over the next seven years, as an officer and a consultant for The Graphics Technology Company, I managed the company's engineering development activities and personally developed dozens of touch screen sensors, controllers, and interactive touch-based computer systems. I designed components for many point-of-sale systems and aided in the system development including products used by Sears, McDonalds, UPS, and other high-volume retailers.

19. I have consulted, formally and informally, for a number of fabless semiconductor companies. In particular, I have served on the technology advisory boards for two processor design companies: BOPS, Inc., where I chaired the board, and Siroyan Ltd., where I served in a similar role for three networking chip companies—Intellon, Inc., Comsilica, Inc., and Entridia, Inc.—and one 3D game accelerator company, Ageria, Inc.

20. I have also served as a technology advisor to Motorola and to several venture capital funds in the United States and Europe. Currently, I am a director at Turtle Beach Corporation, providing guidance in its development of premium audio peripheral devices and user input devices for PCs, mobile devices, and gaming consoles.

21. From 1997 through 2002, I held a variety of executive positions at a publicly held fabless semiconductor company originally called S3, Inc. and later called Sonicblue Inc. I held the positions of Chief Technology Officer, Vice President of System Integration Products, Senior Vice President of Business Development, and Director of Technology, among others. During my time at SonicBlue we launched dozens of PC products and more than 30 new consumer electronics products including a variety of products incorporating wired and wireless communications technologies.

III. MATERIALS REVIEWED

22. The opinions contained in this declaration are based on the documents I reviewed, my professional judgment, as well as my education, experience, and knowledge regarding electrical engineering, computer science, and communications technologies.

23. In forming my opinions expressed in this declaration, I reviewed the following materials:

- the '216 patent (Ex. 1001);
- the file history of the '216 patent (U.S. Patent Application 17/257,570) (Ex. 1002);
- Japanese Published Unexamined Patent Application 2017-126872 (“Nagata”) (Ex. 1005);
- Japanese Published Unexamined Patent Application 2016-140368, (“Hashiguchi”) (Ex. 1006);
- U.S. Patent Application Publication No. 2018/0123887 (“Thubert”) (Ex. 1007);
- Original Japanese Published Unexamined Patent Application 2017-126872 to Nagata, et al. (Ex. 1011);
- Original Japanese Published Unexamined Patent Application 2016-140368 to Hashiguchi, et al. (Ex. 1012);

- U.S. Patent No. 7,567,791 to Laroia, et al. (“Laroia”) (Ex. 1013);
- U.S. Patent Application Publication No. 2017/0011238 to Rößl, et al. (“Rößl”) (Ex. 1014);
- Farhana Afroz et al., “SINR, RSRP, RSSI and RSRQ Measurements in Long Term Evolution Networks,” International Journal of Wireless & Mobile Networks (IJWMN), Vol. 7, No. 4 (Aug. 2015) (“Afroz”) (Ex. 1015);
- Bluetooth Core Specification v5.0, December 6, 2016 (“Bluetooth”) (Ex. 1016);
- Liu Weiyang, et al., “A low power 2.4 GHz transceiver for ZigBee applications,” Journal of Semiconductors, Vol. 34, No. 8 (Aug. 2013) (“Weiyang”) (Ex. 1017);
- Ben W. Cook, et al., “Low-Power 2.4-GHz Transceiver With Passive RX Front-End and 400-mV Supply,” IEEE Journal of Solid-State Circuits, Vol. 41, No. 12 (Dec. 2006) (“Cook”) (Ex. 1018);
- Abdellah Chehri, et al., “Link-Quality Measurement and Reporting in Wireless Sensor Networks,” Sensors Journal (2013) (“Chehri”) (Ex. 1019);

- Baidoo-Williams, Henry, et al., “PHY-layer link quality indicators for wireless networks using matched-filters” (Aug. 2015) (“Baidoo-Williams”) (Ex. 1020);
- U.S. Patent Application Publication No. 2017/0330064 (“Kim”) (Ex. 1021);
- U.S. Patent Application Publication No. 2015/0278890 (“Yang”) (Ex. 1022);
- U.S. Patent Application Publication No. 2003/0133468 (“Haulk”) (Ex. 1023);

and any other material I refer to in this declaration in support of my opinions.

24. All of the opinions contained in this declaration are based on the documents I reviewed and my knowledge and professional judgment. My opinions have also been guided by my appreciation of how a person of ordinary skill in the art would have understood the claims and the specification of the '216 patent at the time of the alleged invention, which I have been asked to initially consider as no earlier than July 2, 2018 (the filing date of China patent application 201810706496.2). *'216 patent*, Cover. My opinions reflect how one of ordinary skill in the art would have understood the '216 patent, the prior art to the patent, and the state of the art at the time of the alleged invention.

25. Based on my experience and expertise, it is my opinion that certain references disclose and/or suggest, alone or in combination, all the features recited in claims 1–19 (“Challenged Claims”) of the ’216 patent, as I explain in detail below.

26. My opinions are based on my years of education, research and experience, as well as my investigation and study of relevant materials. In forming my opinions, I have considered the materials I identify in this declaration and those listed in the Exhibit List at the end of this declaration.

27. I may rely upon these materials and/or additional materials to respond to arguments raised by the Patent Owner. I may also consider additional documents and information in forming any necessary opinions — including documents that may not yet have been provided to me.

28. My analysis of the materials produced in this matter is ongoing and I will continue to review any new material as it is provided. This declaration represents only those opinions I have formed to date.

IV. LEVEL OF ORDINARY SKILL IN THE ART

29. The ’216 Patent identifies the relevant field of art as follows: “The present disclosure relates to the technical field of data communication, and in particular to an interactive electronic tag device communication system and method.” *’216 patent*, 1:17–19. Based on that description of the field of art, my experience, and the information I have reviewed for purposes of this proceeding, I

believe a person of ordinary skill in the art (“POSITA”) in July 2018 would have had a Bachelor’s Degree in electric or computer engineering, computer science, or a similar field with two or more years of work experience with low-power connected devices. Additional education in a relevant field or relevant industry experience may compensate for a deficit in one of the other aspects of the requirements stated above. My level of skill in the art as of July 2018 was at least that of a POSITA. I am qualified to provide opinions concerning what a POSITA would have known and understood at that time, and my analysis and conclusions herein are from the perspective of a POSITA as of that date.

V. RELEVANT LEGAL STANDARDS

30. I am not an attorney and offer no legal opinions, but in the course of my work, I have had experience studying and analyzing patents and patent claims from the perspective of a person skilled in the art.

31. In expressing my opinions and considering the subject matter of the claims of the ’216 Patent, I am relying upon certain basic legal principles that have been explained to me.

32. First, I understand that for an invention claimed in a patent to be found patentable, it must be, among other things, new and not obvious in view of what was known before the invention was made.

33. I understand the information that is used to evaluate whether an invention is new and not obvious is generally referred to as “prior art” and generally includes patents and printed publications (e.g., books, journal publications, articles on websites, product manuals, etc.).

34. I understand that in this proceeding the Petitioner has the burden of proving that the claims of the '216 Patent are anticipated by or obvious in view of the prior art by a preponderance of the evidence. I understand that “a preponderance of the evidence” is evidence sufficient to show that a fact is more likely true than it is not.

35. I understand that in this proceeding, the claims should be given their ordinary and accustomed meaning as understood by one of ordinary skill in the art in view of the patent and its file history. The claims after being construed in this manner are then to be compared to the information in the prior art.

36. I understand that in this proceeding, the information that may be evaluated is limited to patents and printed publications. My analysis below compares the claims to patents and printed publications that are prior art to the claims.

37. I understand that there are two ways in which prior art may render a patent claim unpatentable. First, the prior art can be shown to “anticipate” the claim. Second, the prior art can be shown to have made the claim “obvious” to a person of

ordinary skill in the art. In this declaration I focus on “obviousness.” My understanding of the legal standard for “obviousness” is set forth below.

38. I understand that a claimed invention is not patentable if it would have been obvious to a person of ordinary skill in the field of the invention at the time the invention was made.

39. I understand that the obviousness standard is defined in the patent statute (35 U.S.C. § 103(a)) as follows:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Patentability shall not be negated by the manner in which the invention was made.

40. I understand that the following standards govern the determination of whether a claim in a patent is obvious. I have applied these standards in my evaluation of whether the claims of the '216 Patent would have been considered obvious as of the priority date of the patent.

41. I understand that to find a claim in a patent obvious, one must make certain findings regarding the claimed invention and the prior art. Specifically, I understand that the obviousness question requires consideration of four factors (although not necessarily in the following order):

- The scope and content of the prior art;
- The differences between the prior art and the claims at issue;
- The knowledge of a person of ordinary skill in the pertinent art; and
- Whatever objective factors indicating obviousness or non-obviousness may be present in any particular case.

42. In addition, I understand that the obviousness inquiry should not be done in hindsight, but must be done using the perspective of a person of ordinary skill in the relevant art as of the effective filing date of the patent claim.

43. I understand the objective factors indicating obviousness or non-obviousness may include the following: (1) commercial success of products covered by the patent claims; (2) a long-felt need for the invention; (3) failed attempts by others to make the invention; (4) copying of the invention by others in the field; (5) unexpected results achieved by the invention; (6) praise of the invention by those in the field; (7) the taking of licenses under the patent by others; (8) expressions of surprise by experts and those skilled in the art at the making of the invention; and (9) the patentee proceeded contrary to the accepted wisdom of the prior art. I also understand that any of this evidence must be specifically connected to the invention rather than being associated with the prior art or with marketing or other efforts to promote an invention. I am not presently aware of any evidence of “objective

factors” suggesting the claims are not obvious, and I reserve my right to address any such evidence if it is identified in the future.

44. I understand the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. I also understand that an example of a solution in one field of endeavor may make that solution obvious in another related field. I also understand that market demands or design considerations may prompt variations of a prior art system or process, either in the same field or a different one, and that these variations will ordinarily be considered obvious variations of what has been described in the prior art.

45. I also understand that if a person of ordinary skill can implement a predictable variation, that variation would have been considered obvious. I understand that for similar reasons, if a technique has been used to improve one device, and a Skilled Artisan would recognize that it would improve similar devices in the same way, using that technique to improve the other device would have been obvious unless its actual application yields unexpected results or challenges in implementation.

46. I understand that the obviousness analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, but instead can take account of the “ordinary innovation” and experimentation that does no more

than yield predictable results, which are inferences and creative steps that a Skilled Artisan would employ.

47. I understand that sometimes it will be necessary to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art. I understand that all these issues may be considered to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.

48. I understand that the obviousness analysis cannot be confined by a formalistic conception of the words “teaching, suggestion, and motivation.” I understand that in 2007, the Supreme Court issued its decision in *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398 (2007), where the Court rejected the previous requirement of a “teaching, suggestion, or motivation to combine” known elements of prior art for purposes of an obviousness analysis as a precondition for finding obviousness. It is my understanding that *KSR* confirms that any motivation that would have been known to a person of skill in the art, including common sense, or any motivation derived from the nature of the problem to be solved, is sufficient to explain why references would have been combined.

49. I understand that a person of ordinary skill in the art attempting to solve a problem will not be led only to those elements of prior art designed to solve the

same problem. I understand that under the *KSR* standard, steps suggested by common sense are important and should be considered. Common sense teaches that familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle. As such, the prior art considered can be directed to any need or problem known in the field of endeavor as of the priority date of the patent and can provide a reason for combining the elements of the prior art in the manner claimed. In other words, the prior art does not need to be directed towards solving the same problem that is addressed in the patent. Further, the individual prior art references themselves need not all be directed towards solving the same problem.

50. I understand that obviousness does not require that the features of a secondary reference be bodily incorporated into the structure of the primary reference. Rather, the test is what the combined teachings of those references would have suggested to a Skilled Artisan. The disclosures of the prior art references need not be physically combinable. Combining the teachings of the references should be the focus of the analysis.

51. I understand that an invention that might be considered an obvious variation or modification of the prior art may be considered non-obvious if one or more prior art references discourages or lead away from the line of inquiry disclosed in the reference(s). A reference does not “teach away” from an invention simply

because the reference suggests that another embodiment of the invention is better or preferred. My understanding of the doctrine of teaching away requires a clear indication that the combination should not be attempted (e.g., because it would not work or explicit statements saying the combination should not be made).

52. I understand that a person of ordinary skill is also a person of ordinary creativity.

53. I further understand that in many fields, there may be little discussion of obvious techniques or combination, and it often may be the case that market demand, rather than scientific literature or knowledge, will drive design trends. When there is such a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within their technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious. The fact that a particular combination of prior art elements was “obvious to try” may indicate that the combination was obvious even if no one attempted the combination. If the combination was obvious to try (regardless of whether it was actually tried) or leads to anticipated success, then it is likely the result of ordinary skill and common sense rather than innovation.

54. I understand that for a claim to be valid, its scope must be definite, and that improperly introducing a term can lead to an unascertainable scope of a term, rendering it indefinite. I understand that any claim element first addressed in the claims by the antecedent basis, “a” may then be identified later in the claims by the antecedent basis, “the.” I understand that failing to follow this convention may lead to ambiguity in the identification of the particular claim element in question, leading to an indefinite scope of the claim’s term. For purposes of this proceeding, I identified and provided my best understanding of any such terms despite such ascertainable scope.

VI. SUMMARY OF OPINIONS

55. For the reasons I explain below, it is my opinion that claims 1–19 of the ’216 patent are disclosed in and rendered obvious by the prior art.

VII. BRIEF DESCRIPTION OF THE TECHNOLOGY

A. Background of the Technology

56. As I explain more fully below, the Nagata, Hashiguchi, and Thubert prior art references generally relate to low-power device network communications.

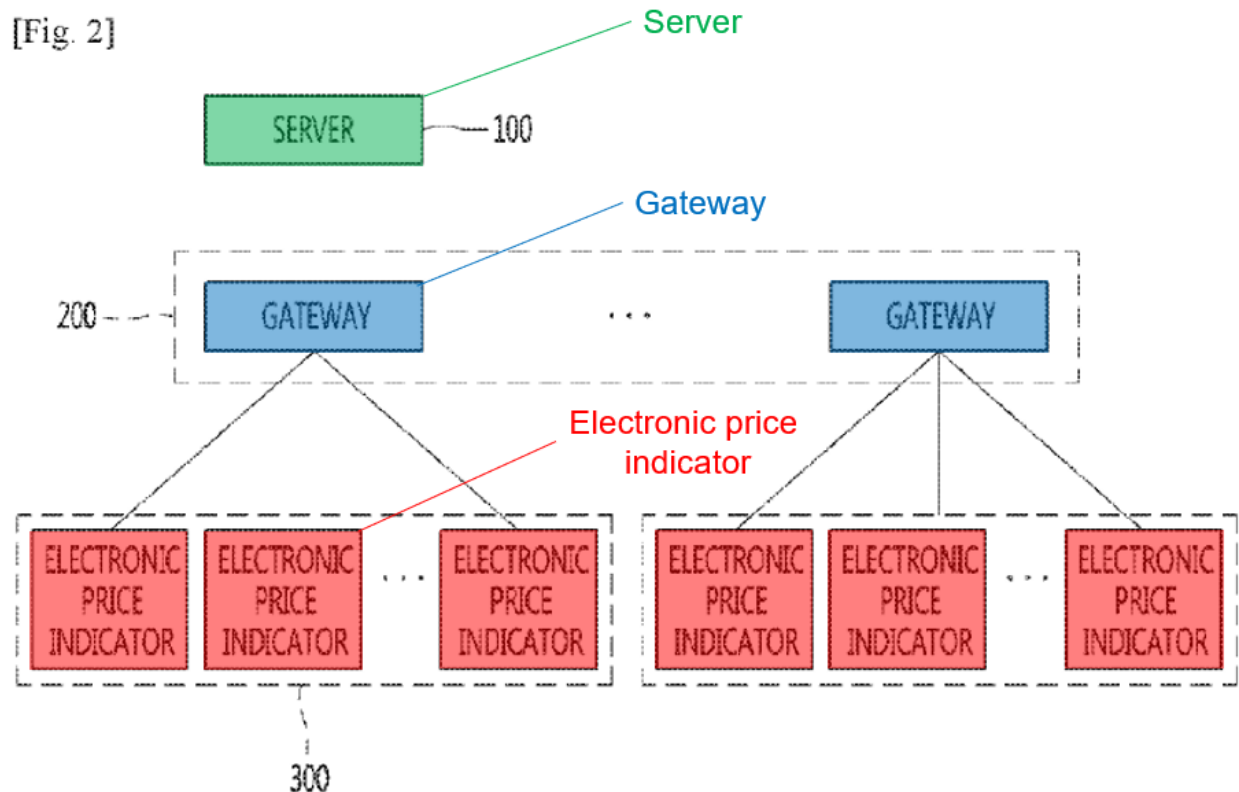
57. The ’216 patent at issue in this matter is related to low-power, wireless network-connected electronic rack and shelf label systems. These systems typically employ a hub-and-spoke type of server architecture to communicate bidirectional messages between a centralized server and many battery-operated, widely-

distributed node devices using base station transceivers as relays. In order to provide context for this patent and the state of the technology at the time it was filed, I provide the following high-level review and examples of known low-power, wireless electronic rack label systems preceding July 2, 2018—the asserted priority date of the '216 patent. *'216 patent*, Cover.

B. Low-Power, Wireless Electronic Shelf Label Systems

58. Wireless electronic shelf label systems and methods for wirelessly communicating and displaying merchandise information constrained by battery power consumption were well known and established prior to the '216 patent. For example, Kim (Ex. 1021) discloses using battery-powered electronic shelf labels in a store that wirelessly receives product-related information (e.g., product image, price, promotional information and barcode identification) from a server to display on a shelf front for a product adjacent to the label. *Kim*, [0002]–[0009]. Similarly, Yang (Ex. 1022) describes battery-powered electronic information labels used to show merchandise information on store shelves that wirelessly communicate with a server via a gateway to update the merchandise information. *Yang*, [0003]–[0005], [0009]–[0010]. Also, Haulk (Ex. 1023) describes an electronic shelf label systems used in “transaction establishments” to display merchandise price items along shelf fronts. *Haulk*, [0001]–[0002].

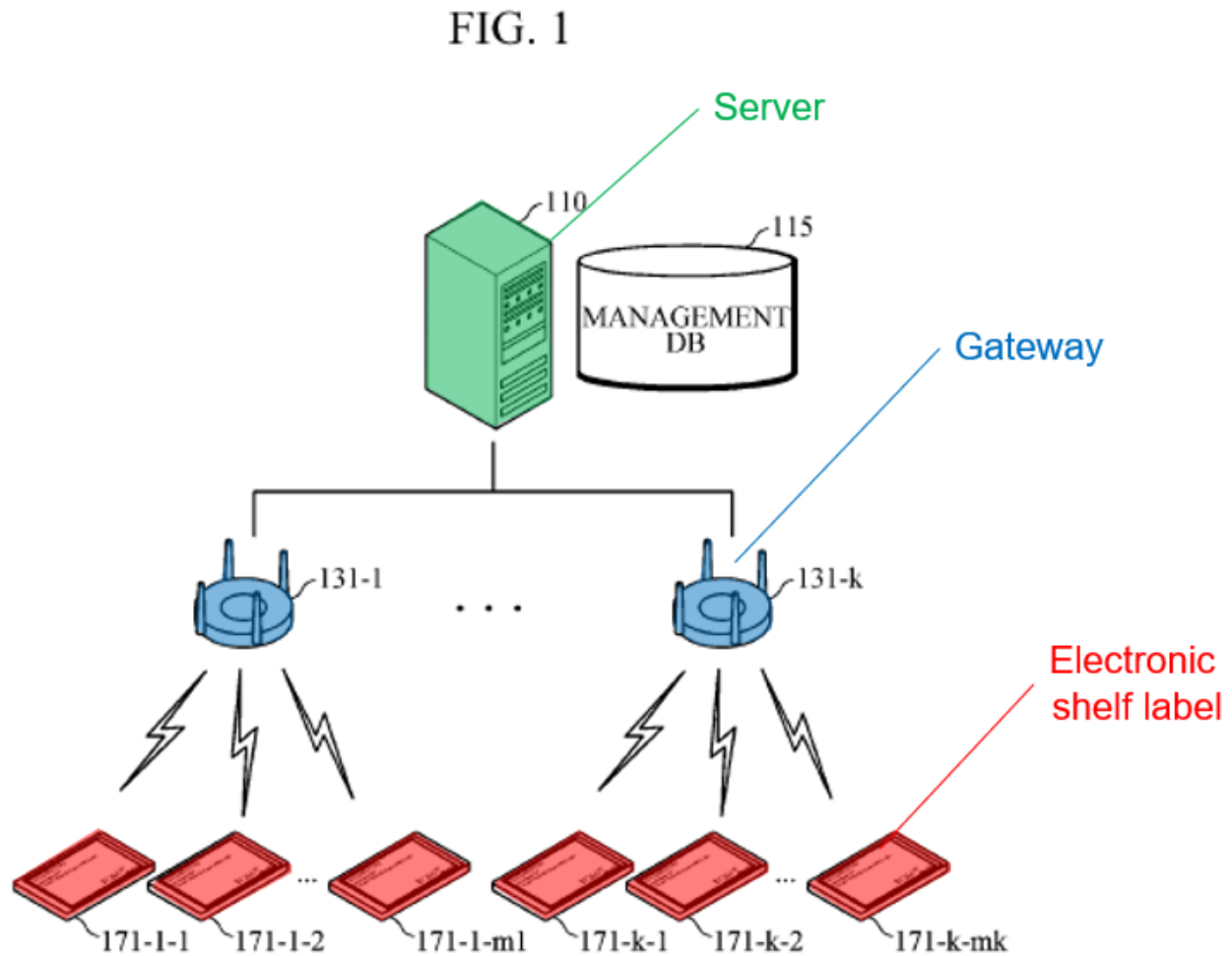
59. Electronic shelf label systems typically use a distributed client-server type of network architecture. By example, Kim discloses an “electronic price indicating system” that includes a server 100 (green) and electronic price indicators 300 (red) that display product information associated with those indicators and uses a communication channel to send a product information update message from the server to the indicator via a gateway 200 (blue) shown in my annotated version of Figure 2, which I provide below:



Kim, Fig. 2, [0076], [0083], [0088]–[0089].

60. Likewise, Yang discloses an electronic information label system with an adjustable wakeup update period. *Yang*, Title. Yang’s system includes a central management server 110 (green) and electronic shelf labels 171 (red) that

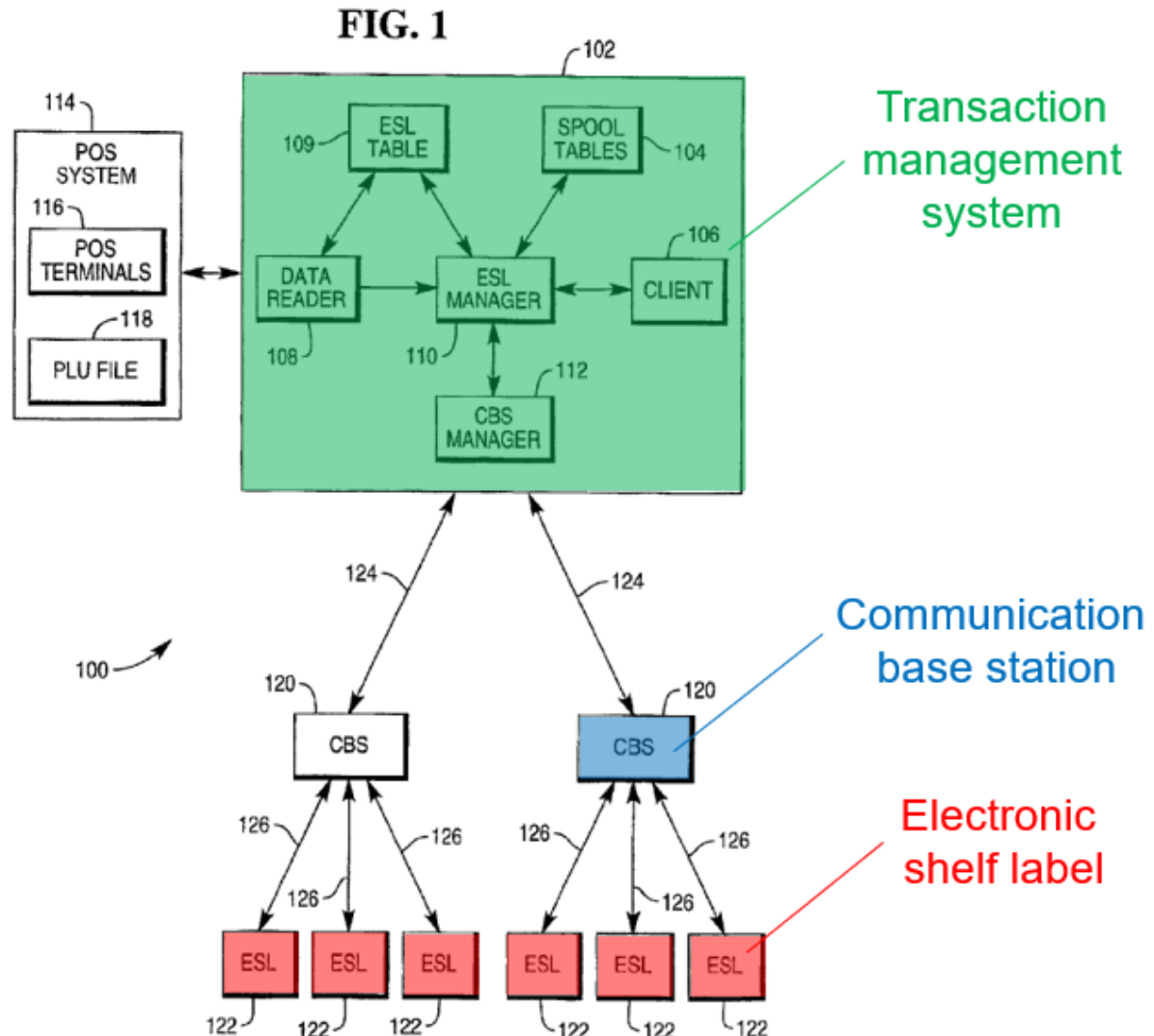
communicate with each other via gateways 131 (labeled relay stations) (blue) to display and update merchandise information associated with store merchandise as shown in my annotated version of Fig. 1, which I provide here:



Yang., Fig. 1, Abstract, [0003], [0027].

61. Additionally, Haulk discloses an electronic price label system that includes a centralized transaction management system server (green) that communicates with electronic shelf labels (or “ESLs,” red) via communication base

stations (or “CBS’s”, blue) as shown in my annotated version of Figure 1, which I provide here:



Haulk., Fig. 1, [0002], [0014]–[0016], [0020].

62. Using this common architecture, electronic rack labels systems communicate product information and updates to that information using bidirectional communications channels. These are, e.g., Haulk’s radio frequency- (RF)-based “communication links” 124 and 126 used for transmitting messages and

responses to those responses as shown in my annotated figure 1, directly above. *Id.*, Fig. 1, [0019]–[0020]. Kim’s system specifies using communication channels conforming to, e.g., the Institute of Electrical and Electronics Engineers (“IEEE”) 802.15.4 and 802.15.1 standards (also referred to as a Zigbee and Bluetooth type of channel, respectively). *Kim*, [0092], [0095]. Yang’s system does likewise. *Yang*, [0006], [0027], [0057]. Kim even proceeds to state the Zigbee standard is what makes communication between shelf labels and a central server both “possible” and “efficient.” *Kim*, [0095]. These standard network communication channel types are uniquely suited for electronic shelf label systems because they are specially and technically tuned to connect widely distributed, network-connected low-energy Bluetooth devices to a server using the unlicensed 2.4 gigahertz (GHz) Industrial, Scientific and Medical (ISM) radio frequency band.

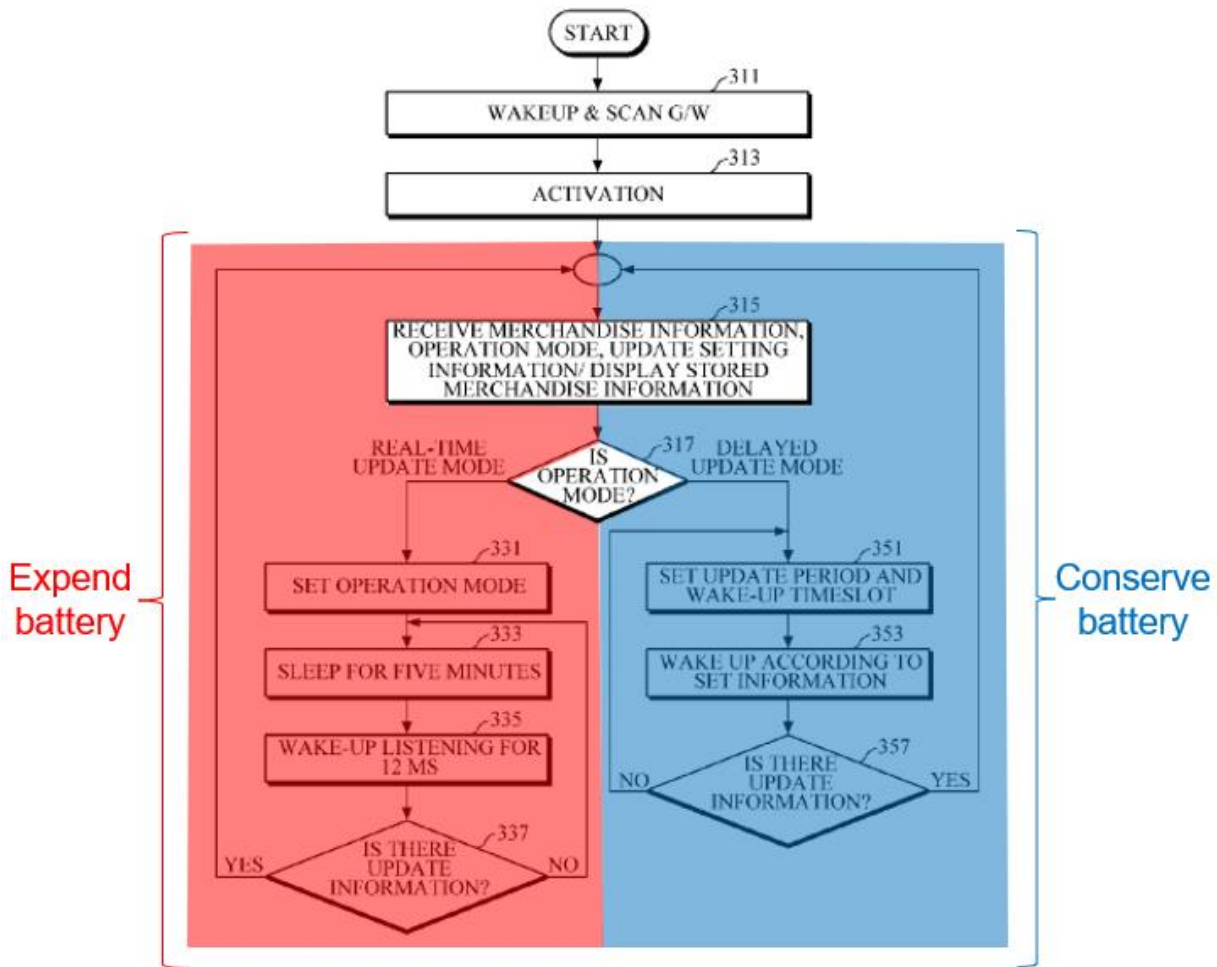
63. Specifically, the Bluetooth Specification v5.0 published in 2016 (Ex. 1016) describes enhanced power control management techniques available for connected devices operating according to these standards in the 2.4 GHz ISM band. *Bluetooth*, 535–537. Weiyang (Ex. 1017) describes the IEEE 802.15.4 (Zigbee) standard as a “low cost and low power short-range wireless communication standard.” *Weiyang*, § 1. This standard also offers “excellent security.” *Yang*, [0057]. Cook (Ex. 1018) concludes that the 2.4 GHz ISM band is ideally tailored to supporting multi-year wireless network-connected, battery-powered devices with

low data transmission rate (e.g., 1 megabyte per second) because this type of network supports ultra-low power transceivers that can operate for multiple years without battery replacement. *Cook*, §§ I–II. *Chehri* (Ex. 1019) touts the benefits of reliability and longevity attained by using the 2.4 GHz ISM band for connecting widely-dispersed, battery-powered nodes. *Chehri*, 3067, 3069–71 (describing critical battery-powered environmental monitoring node devices fielded throughout the tunnels of a Canadian mine relay underground conditions for health and safety determinations).

64. Even while operating in the 2.4 GHz ISM band with available ultra-low power transceivers, however, node devices (electronic shelf labels) must still expend battery power with each transmission requiring the labels to turn on and utilize their communication components—e.g., antennas, transmitters, receivers and associated circuitry—to exchange information with a server via a gateway. *See, e.g., Yang*, [0005]. To manage this battery-constrained energy drain, electronic shelf labels implement a “wake-up method” to cycle the label communication components on when needed to transmit or receive data, and off again to preserve the battery. *See, e.g., Kim*, [0098]–[0104] (“electronic price indicator 300 is managed using a wake-up method” that sends the indicator into a “deep sleep mode to minimize power consumption” until the next signal-generated interrupt wakes up the device to implement a after the device wakes up to check for data . *See also Haulk*, [0023]

(describing listening for messages and transmitting responses only within a very specific timeframe). To best manage the amount and duration of a label's battery power drain, the wake-up method is best programmed to occur at certain known times (e.g., wake up at a frequency of once every five minutes) and for a certain known duration of time (e.g., the label stays awake for 12 milliseconds). *Yang*, [0005], [0007]. This allows a label user to balance the need to update a label to correctly reflect whatever merchandise information it should display with the need to preserve that label's battery. *Id.*, [0009], [0032] (describing a short-term, "real-time update mode" and longer-term, "delayed update mode" that use and conserve more battery, respectively). Yang's different label operating modes conserve battery power by cycling between the two modes shown in my annotated version of Figure 3, which I provide here:

FIG. 3



Id., Fig. 3, [0033]–[0046] (describing the steps of Figure 3). Yang’s Table 1 provides an example of timed cycling between the modes, which I provide below:

Time	Operation mode
10:00	Real-time update mode
11:00	Delayed update mode
17:00	Real-time update mode
20:00	Delayed update mode
24:00	Real-time update mode
01:00	Delayed update mode

Id., [0042]–[0043]. Such methods mitigate the electronic shelf label battery conservation problem.

65. But one other problem may arise in electronic shelf label systems. Tens, hundreds, or even thousands of electronic shelf labels attempting to “talk” with a single server may create interference resulting in a residual “listening” problem not unlike one person attempting to understand an entire crowd of speaking people, or that same crowd all attempting to hear that one person. But this is mitigated by breaking down the “discussion” into groups of node-gateway pairs and allocating express transmission time slots to different gateways (i.e., taking turns communicating). *Yang*, [0041]; *Haulk*, [0004]. As the article by Baidoo-Williams (Ex. 1020) explains, nodes and gateways can be assigned by “listening” to the node-gateway communication and assessing its communicative strength using several parameters (e.g., link quality indicators (“LQI”) or received signal strength indicators (“RSSI”)). *Baidoo-Williams*, Abstract, §§ I.A–C. By measuring and assessing these parameters, a server can assign or re-assign node-gateway pairs to improve network performance. *Id.*, § I.C (describing how “the IEEE 802.15.4 standard includes specifications for LQI” and implementing protocols designed with LQI in mind “realize[s] significant improvements in network performance”). Kim states the Zigbee standard is what makes communication between shelf labels and a

central server possible, but also efficient by dividing the communication channels up amongst gateways communicating with the electronic shelf labels. *Kim*, [0095].

66. Thus, it is my opinion in view of my review above that a POSITA would have understood and recognized several low-power wireless shelf label systems existed and addressed both problems and solutions to connectivity, communicability, and power-based issues in those systems prior to the asserted priority date of the '216 patent.

VIII. OVERVIEW OF THE '216 PATENT

A. Specification

67. By my review, the '216 patent (Ex. 1001) is directed to an “Interactive Electronic Tag Device Communication System and Method.” *'216 patent*, Title. The patent describes a problem in which large-scale, battery-operated radio frequency communicating electronic tag devices consume battery power when they communicate, causing increased part and labor costs commensurate with frequent battery replacements. *Id.*, 1:51–2:3. The '216 patent proposes mitigating power consumption by switching tag devices between a normal (less frequent) and fast (more frequent) communication monitoring mode and a base station in a normal and fast wake-up mode to conserve power by reducing communication, while preserving “customer experience requirements.” *Id.*, 6:35–42. The '216 patent further discloses that each tag has two “communication paths,” with a first path capable of

communicating with a server through base stations, and second path capable of communication with an external device in a process flow disclosed in Figure 2, but also mirrored in the description and depiction in Figure 3, provided here:

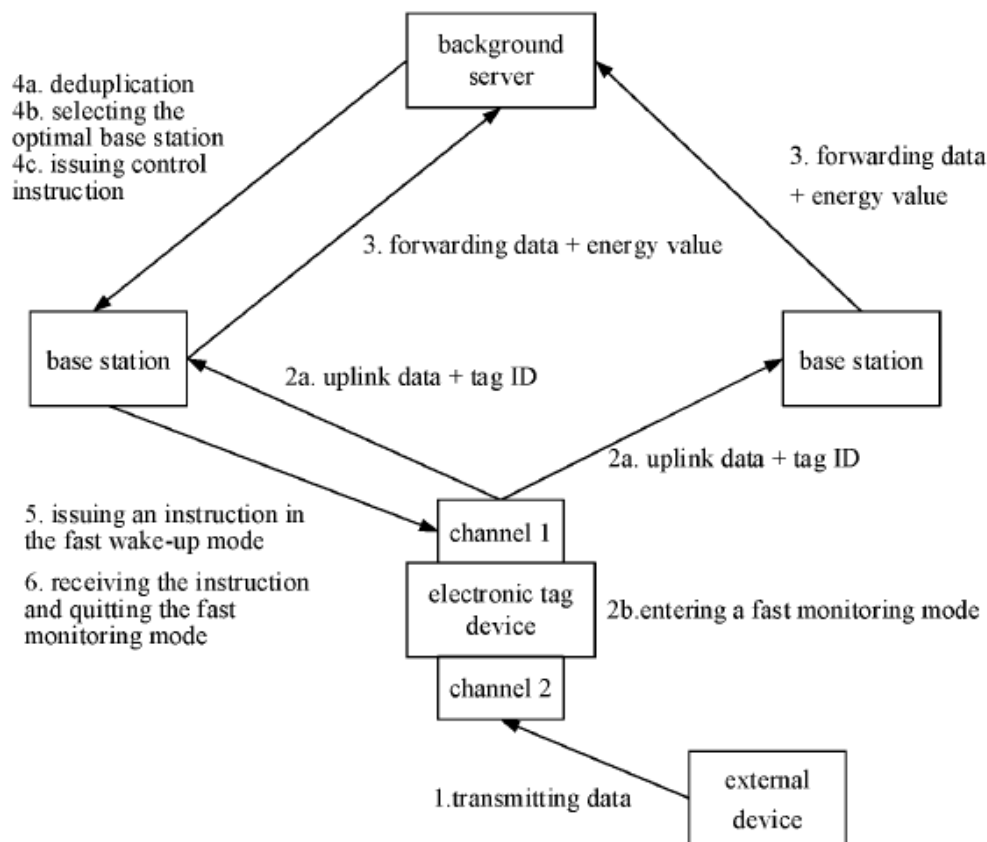


FIG. 3

Id., Fig. 3, 6:1–24, Fig. 2, 5:31–63.

B. Prosecution History

68. I understand the '216 patent issued from U.S. Application No. 17/257,570, filed with a 35 U.S.C. § 371(c)(1)(2) national stage entry date of January 2, 2021. '216 patent, Cover. The '216 patent claims priority to international Patent Cooperation Treaty (PCT) application PCT/CN2019/070431 filed January 4, 2019,

which claims foreign priority to China patent application 201810706496.2, dated July 2, 2018. *Id.* For purposes of this declaration, I treat July 2, 2018 as the earliest date of the '216 patent.

69. By my review, I see the Examiner rejected only then-pending '216 patent claims 14–19 in one non-final office action for reciting a “computer readable storage medium” without limitation to a non-transitory form, therefore finding the claim scope included signal *per se* deemed ineligible patent subject matter per 35 U.S.C. § 101. *'216 patent file history* (Ex. 1002), 247–51. The examiner cited five patent references in the office action, none of which are, or are related to, the Nagata, Hashiguchi, and Thubert prior art references relied upon in this petition. *Id.*, 249–50, 252. Then-Applicant amended claims 14–19 to recite a “non-transitory computer readable storage medium” (added language emphasis original). *Id.*, 301–03. The Examiner then issued a notice of allowance, reasoning only that the prior art previously identified failed to anticipate or render obvious “switching between normal and fast wake-up modes of an electronic tag device via two communication paths by a control instruction and a fast wake-up instruction.” *Id.*, 311 (internal quotations omitted). The '216 patent issued on December 27, 2022. *'216 patent*, Cover.

70. By my review, none of the Nagata, Hashiguchi, nor Thubert prior art references I discuss in the paragraphs immediately following are included in or are related to a reference included in the '216 patent's file history.

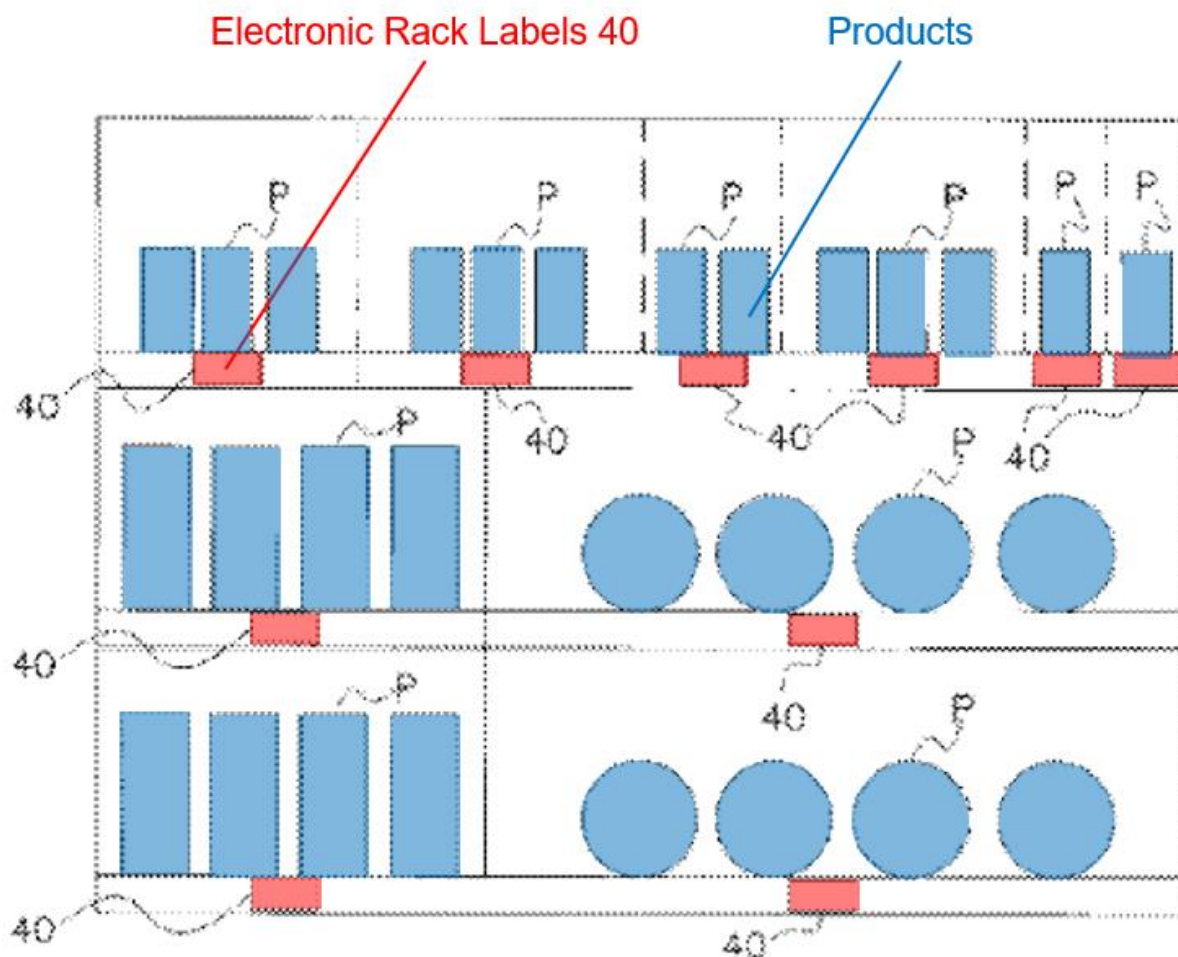
IX. OVERVIEW OF THE PRIOR ART REFERENCES

71. Below is an overview of the primary prior art references that I considered when analyzing the validity of the claims of the '216 Patent.

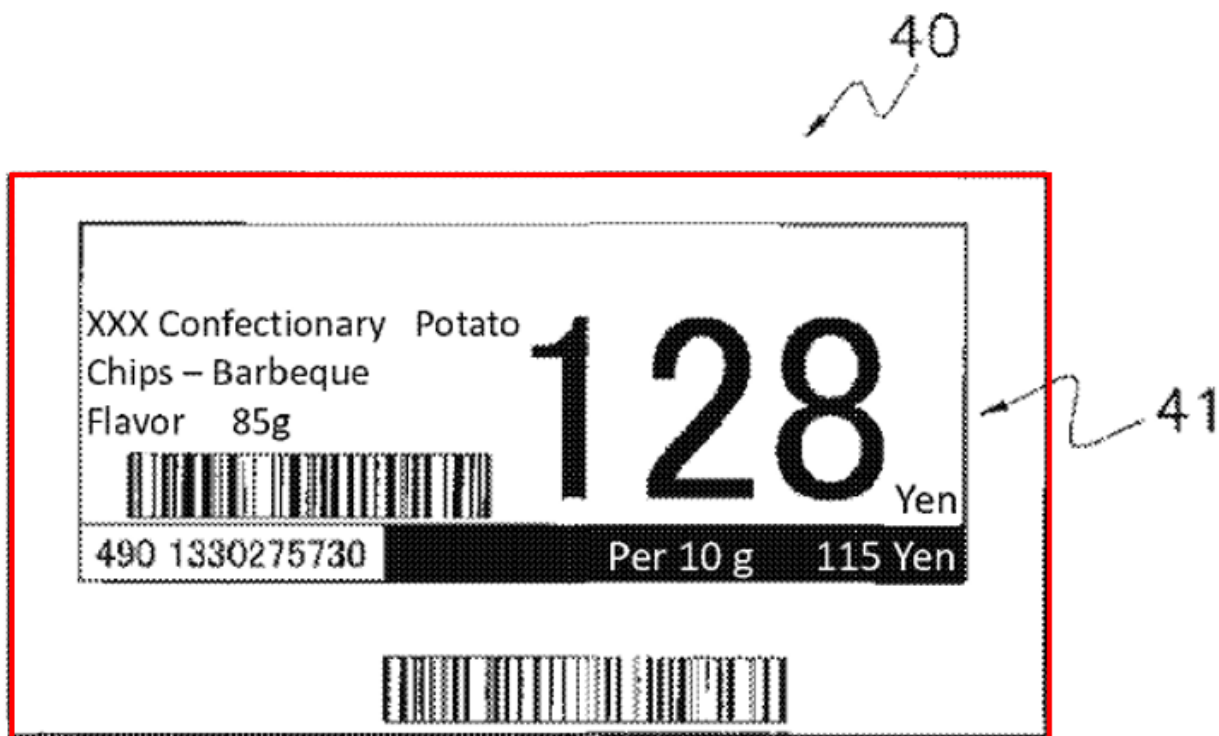
A. Nagata

72. Nagata (Ex. 1005), is an Ishida Co., Ltd. ("Ishida") patent application publication.² *Nagata*, Cover. *Nagata* is directed to a wireless display system in a supermarket or convenience store that utilizes electronic rack labels to display updateable product information of products associated with those labels. *Id.*, Abstract, [0026], [0114]. Products (blue) are displayed above the electronic rack labels 40 (red) as arranged as shown in my annotated version of Figure 2, which I provide here:

² Ishida is a Japanese company founded in 1893 as a manufacturer of weight scales that has since grown into an international footprint and expanded its market solutions to offer logistical and food-based automation systems including "Japan's first 'wireless electronic shelf labelling system'" in 1998. See <https://www.ishida.com/ww/en/about-us/history/>.

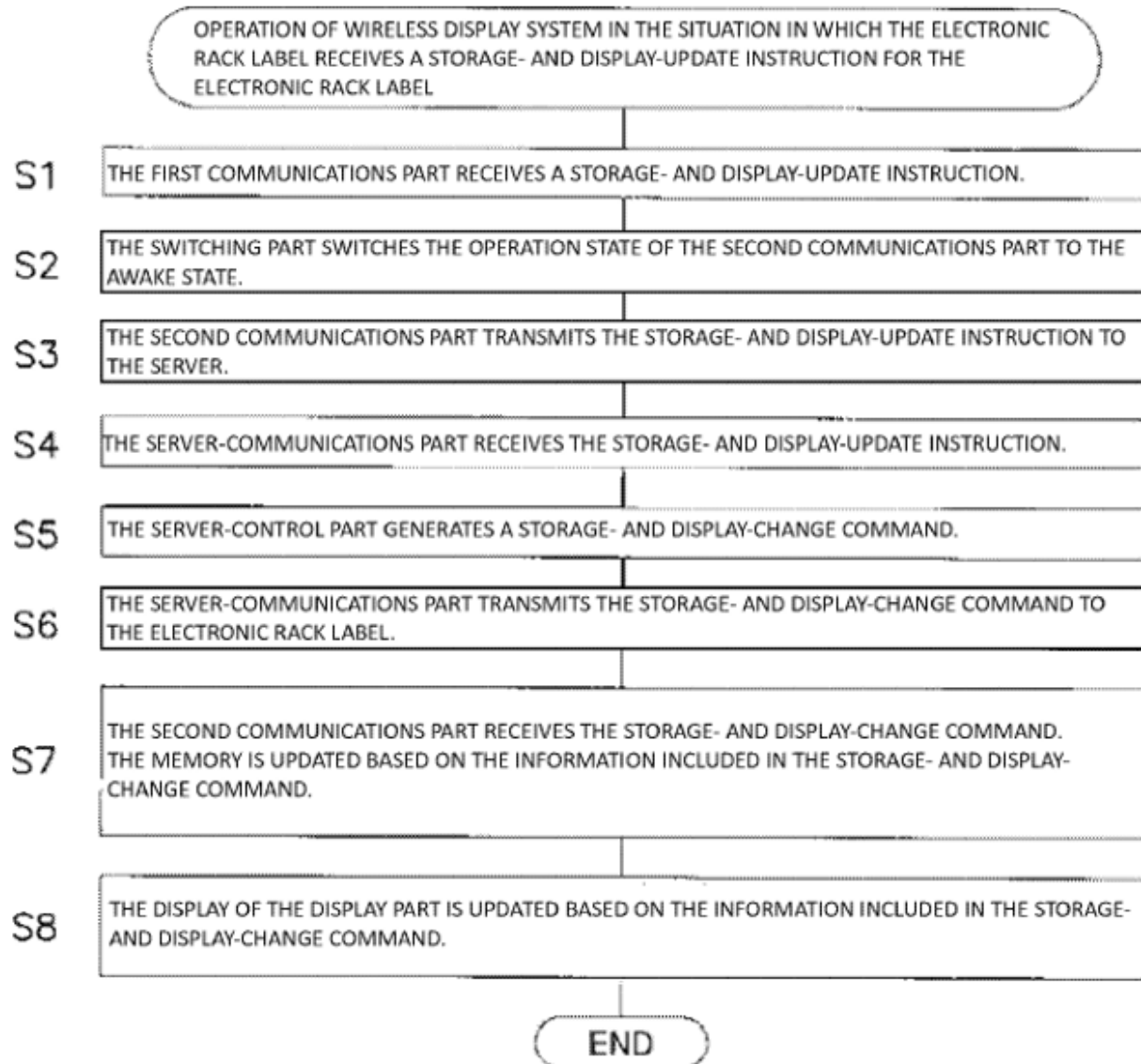


Id., Fig. 2, [0048]. Each rack label (red) displays product information such as the type of product, its price, and a barcode affiliated with that product as shown in my red-outlined version of Figure 3, which I provide here:



Id., Fig. 3, [0028].

73. A worker may rapidly change the display of the electronic rack label by initiating a command at either a remote control 80 or smart phone 180, which sends an instruction to change a specific display containing specific product information of the label, which is relayed through an access point to a server to generate a command including updated image data transmitted back down to the electronic rack label through an access point. *Id.*, [0114]–[0123] (describing a “Situation in Which a Storage- and/or Display-Update Instruction for an Electronic Rack Label Is Received”). This process is shown in the steps of Figure 8, provided here:



Id., Fig. 8.

74. Because the electronic rack labels are battery operated, their power consumption must be managed to prevent excessive battery drain and replacement. *Id.*, [0029]. The electronic rack labels thus transition between sleep and awake modes to communicate according to known time intervals and durations with the access point and server to carry out a change display instruction. *Id.*, [0029], [0114],

[0123]. The access points further use beacons to prepare an electronic rack label to wake up to receive and implement a server-generated command (thereby consuming battery power) or return to sleep (to save battery power). *Id.*, [0033], [0083].

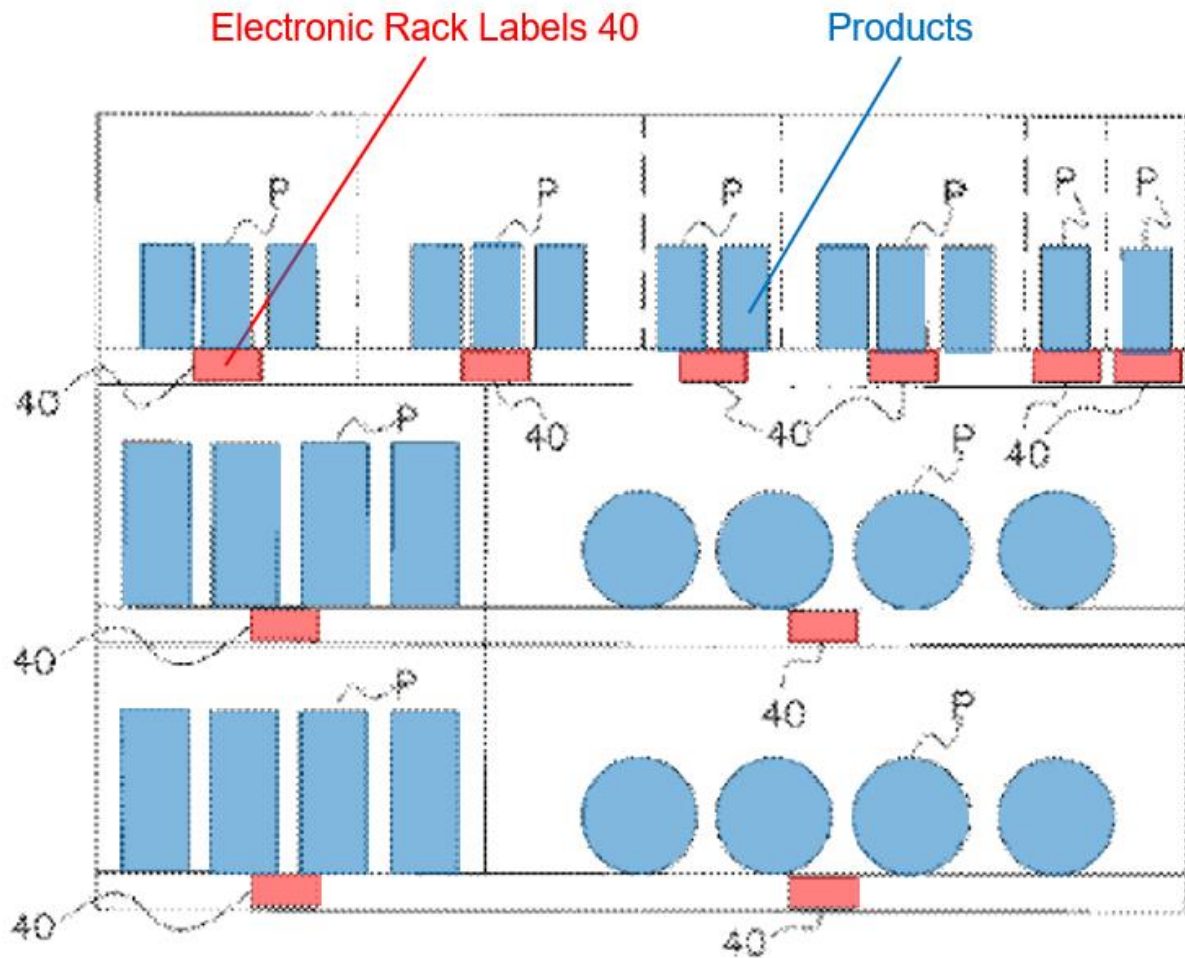
75. In my opinion, Nagata is analogous art to the '216 patent because both are directed to the same field of wireless communications systems and networks, and in particular to electronic rack labels and updating electronic rack labels. Nagata is also analogous art to the '216 patent because both address the same problem of improving battery life in the electronic rack label. *Compare*, '216 Patent, 1:42–50; 1:65–2:1; 2:7–16; 3:22–29; 6:35–47, *with Nagata*, [0029], [0034], [0124], [0135].

B. Hashiguchi

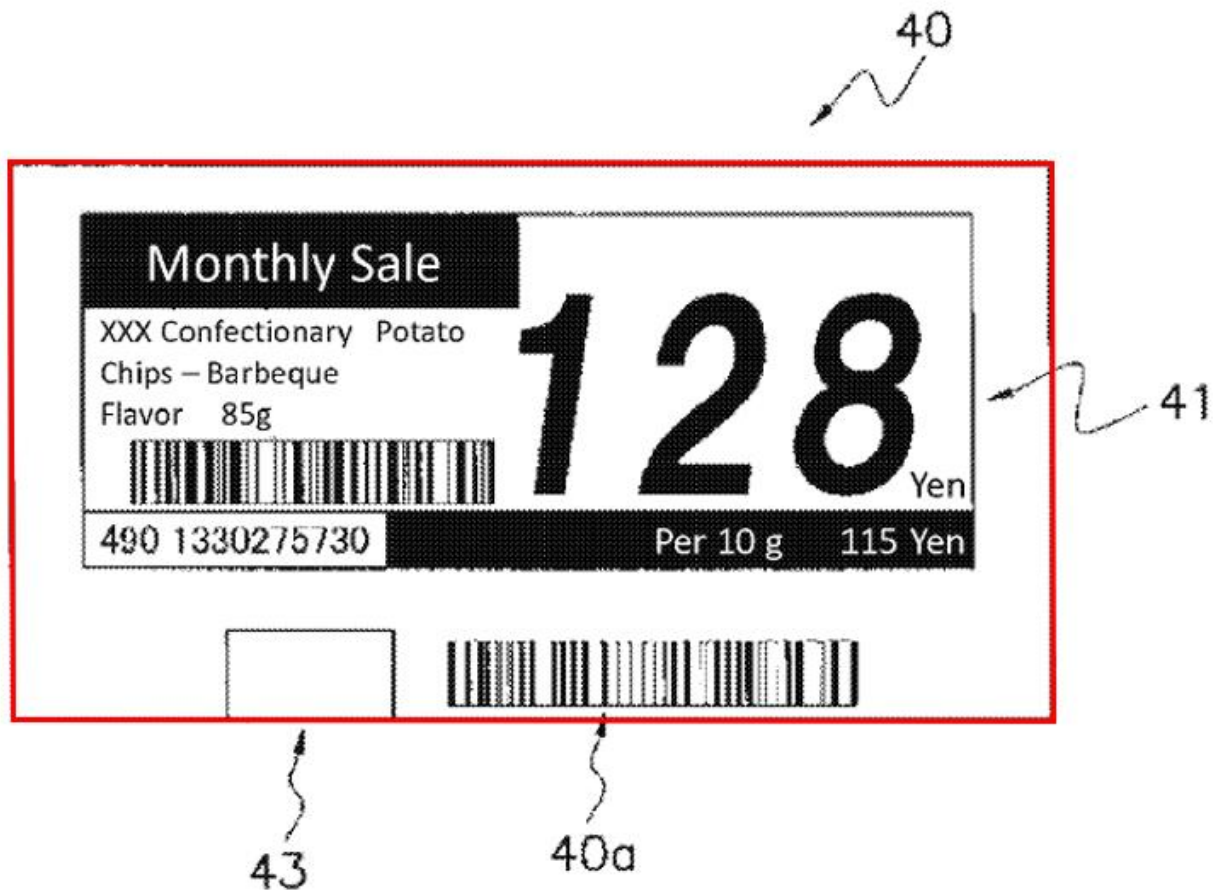
76. From my review, I see that Hashiguchi (Ex. 1006), another Ishida patent application publication, shares inventorship and an applicant with Nagata. *Compare Nagata*, field codes (72) (Inventors: Yoshinoria Nagata, Nobuki Hashiguchi, et al.), (71) (Applicant: Ishida Co., Ltd.) *with Hashiguchi*, field codes (72) (Inventors: Nobuki Hashiguchi, et al.), (71) (Applicant: Ishida Co., Ltd.).

77. Like Nagata, Hashiguchi is directed to an electronic rack label and wireless display system in a supermarket or convenience store that utilizes electronic rack labels to display updateable product information of products associated with those labels. *Hashiguchi*, Abstract, [0027], [0030]. Products (blue) are displayed

above the electronic rack labels 40 (red) as arranged as shown in my annotated version of Figure 2, which I provide here:



Id., Fig. 2, [0029]. Each rack label (red) displays product information such as the type of product, its price, and a barcode affiliated with that product as shown in my respective, red-outlined version of Figure 3, which I provide here:



Id., Fig. 3, [0034].

78. A worker may link a product to an electronic rack label and instruct the label to display that production information in a linking operation. *Id.*, [0032]. A user first transmits a trigger signal to the electronic rack label from a handy terminal using near-field communications, and the handy terminal subsequently collects and which transmits product information, electronic rack label identification information, and an instruction to change a specific display to a server to generate a command including updated image data transmitted back down to the electronic rack label through an access point. *Id.*, [0135] (describing handy terminal and electronic

rack label operations), [0055]–[0059] (describing server and access point transmission operations).

79. Because the electronic rack labels are battery operated, their power consumption must be managed to prevent excessive battery drain and replacement. *Id.*, [0045], [0069]. The electronic rack labels thus transition between sleep and awake modes to communicate according to known time intervals and durations synchronized with the access point and server to carry out an instruction to change an electronic rack label display. *Id.*, [0068]–[0071]. The access points further use beacons to prepare an electronic rack label to wake up to receive and implement a server-generated command (thereby consuming battery power) or return to sleep (to save battery power). *Id.*, [0127]–[0129].

80. I see that Hashiguchi discloses two embodiments. *Compare Hashiguchi*, Fig. 1, [0026]–[0028] (first embodiment) *with id.*, Fig. 9, [0109]–[0113] (second embodiment). The second incorporates the characteristics of the first and explains any differences from the first by exception. *Id.*, [0113]–[0114] (“the overall configuration of the electronic rack label system 201 [first embodiment] is the same as that of the electronic rack label system 1 [second embodiment],” those features that are the “same” between the embodiments are “omitted,” but Hashiguchi explains “the points of difference” where applicable and relevant).

81. In my opinion, Hashiguchi is analogous art to the '216 patent because both are directed to the same field of endeavor of wireless communications systems and networks, and in particular to electronic rack labels and updating electronic rack labels. Hashiguchi is also analogous art to the '216 patent because both address the same problem of improving battery life in the electronic rack label. *Compare '216 Patent*, 1:42–50; 1:65–2:1; 2:7–16; 3:22–29; 6:35–47, *with Hashiguchi*, [0007], [0009], [0011], [0017], [0021], [0022], [0082], [0147], [0157], [0158].

C. Thubert

82. Thubert (Ex. 1007), a Cisco Technology, Inc. patent application publication, discloses a wireless communication network that includes a supervisory device (e.g., server), a plurality of access points (APs) 302, and nodes 306 (e.g., end-point devices). *Thubert*, [0047]. The plurality of APs 302 may be grouped into virtual access points (VAP or VAPs) that receive a “broadcast network availability request 308” from node 306 and capture data regarding the request. *Id.*, [0054]. The captured data may include characteristics of the received request, such “a link quality indicator (LQI), a signal to noise ratio (SNR), or received signal strength indicator (RSSI), or the like,” which allows an AP to determine if the signal strength is “fair,” “good,” or “excellent” as disclosed in Fig. 3A, provided here:

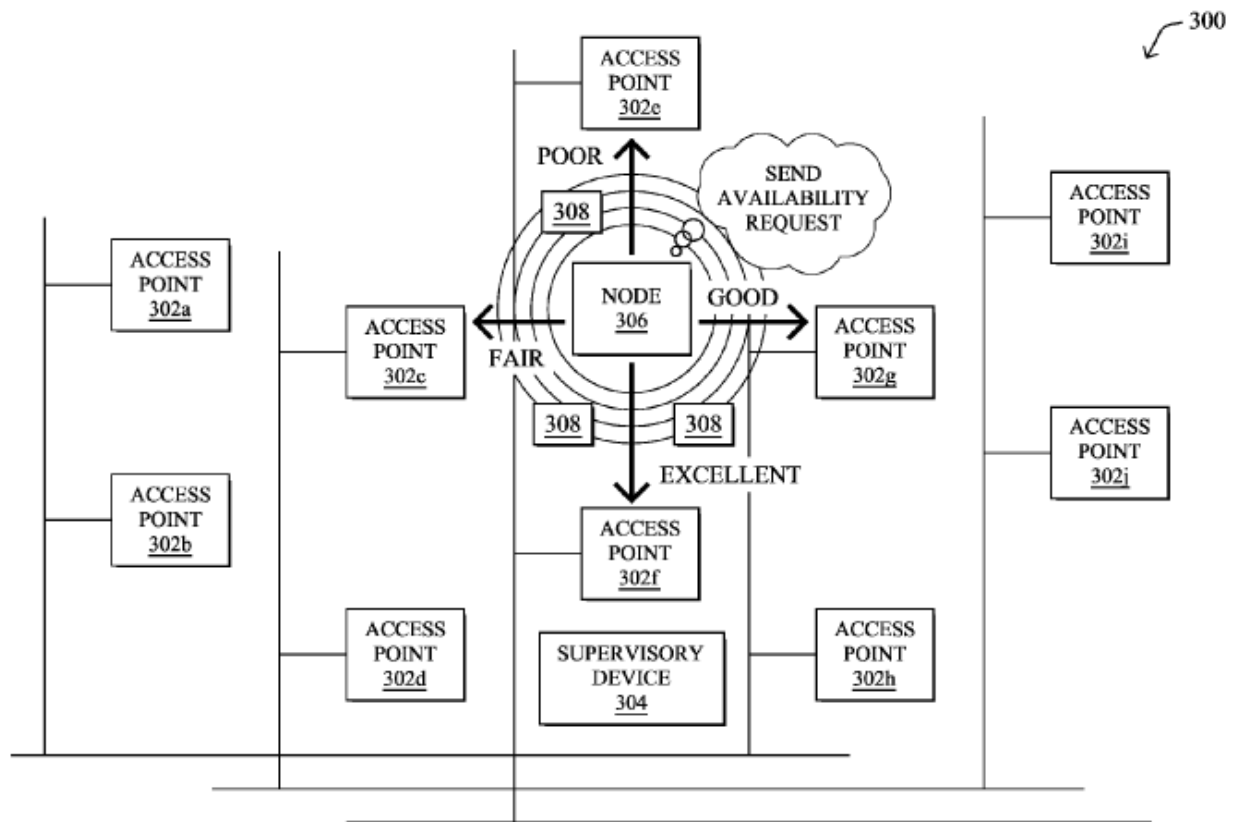
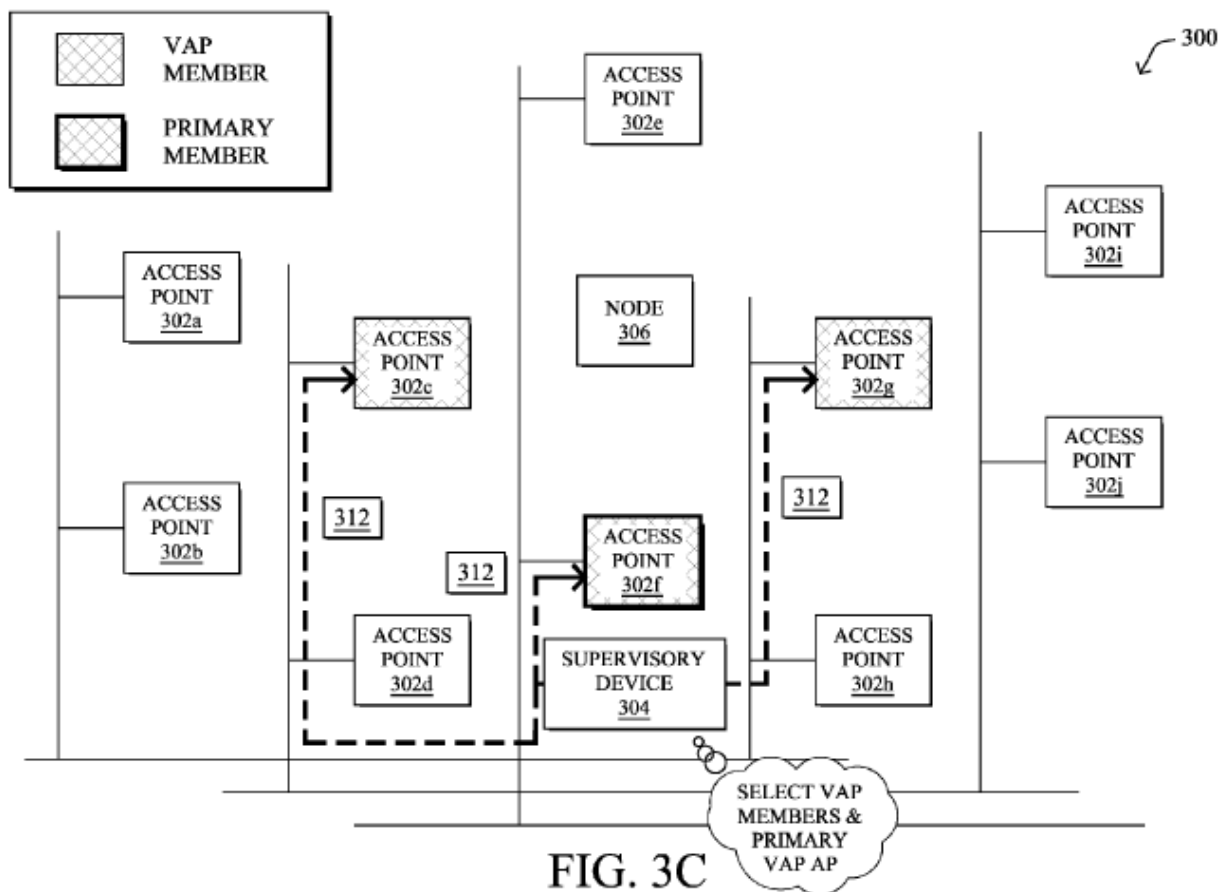


FIG. 3A

Id., Fig. 3A, [0054], [0055]. The APs report this data to supervisory device 304, which may “designate one of the selected APs 302 as the primary AP 302.” *Id.*, [0057]. The primary AP may be the AP with “the best signal quality,” such as AP 302f for node 302 as disclosed in Fig. 3C, provided here:



Id., Fig. 3C, [0057].

83. Thubert's server also traffic-engineers communication paths shared by nodes and access points to eliminate duplicate copies of data packets using egress 600, shown in Figure 7C, provided here:

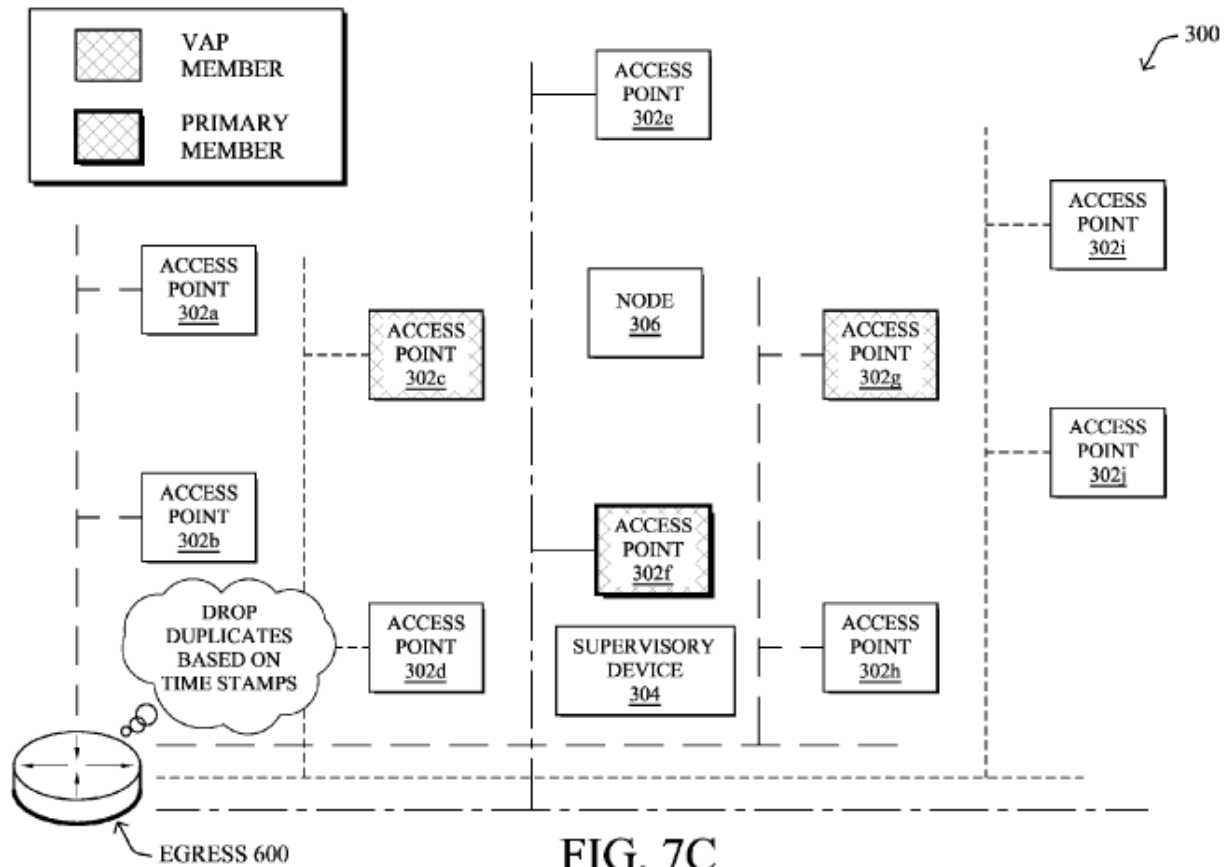


FIG. 7C

Id., Fig. 7C, [0094].

84. In my opinion, Thubert is analogous art to the '216 patent because it deals with the same field of endeavor of wireless communications systems and networks and because it addresses at least one of the same problems as the '216 patent, which is improving communications between the end-point device (e.g., node or electronic tag device) and a server by selecting the access point with the strongest signal to perform the communications. *Compare '216 Patent*, 4:61–5:10, 6:9–21, Fig. 3, *with Thubert*, [0051]–[0059], Figs. 3A–3D.

X. CLAIM CONSTRUCTION

85. I have given all the claim terms of the Challenged Claims their plain and ordinary meaning, as would have been understood by a person of ordinary skill in the art, at the time of the alleged invention, which I understand is July 2, 2018 for claims 1–19, having taken into consideration the language of the claims, the specification, and the prosecution history of record as reflected in the '216 patent and its file history. *See generally* '216 patent (Ex. 1001), '216 patent file history (Ex. 1002).

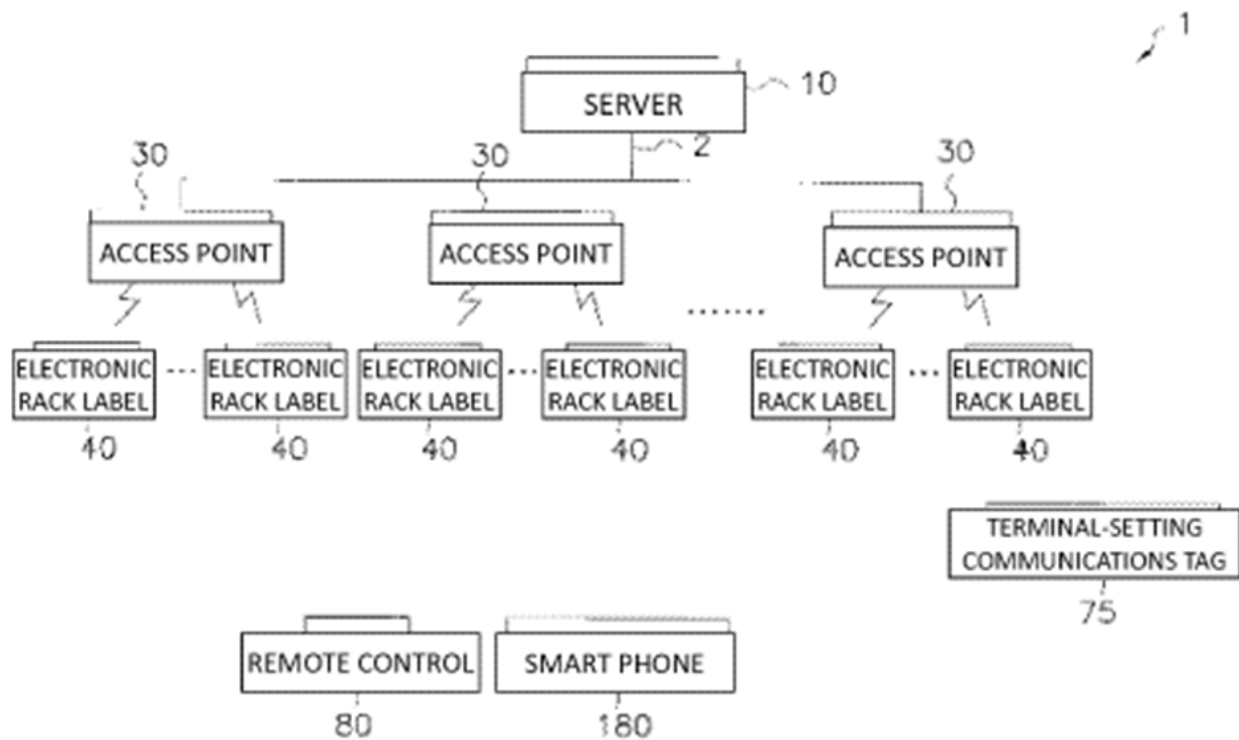
XI. DETAILED EXPLANATION OF GROUNDS

A. Ground 1: Obviousness over Nagata (Claims 1, 2, 5–8, 11–15, 18–19)

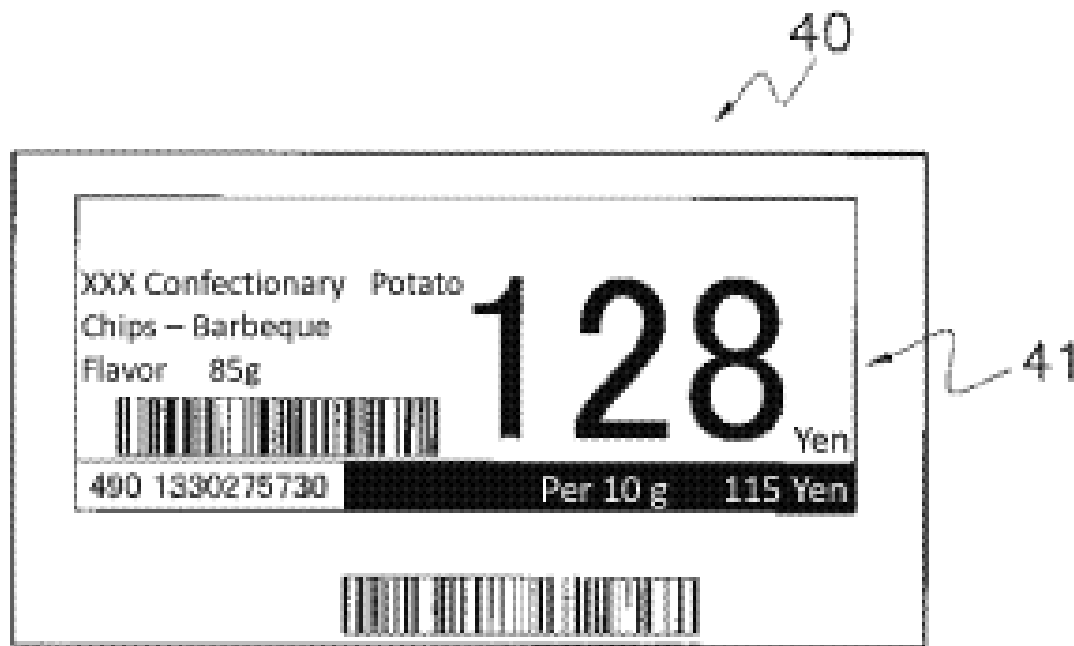
1. Claim 1

a. Claim 1.0: “An interactive electronic tag device communication system, comprising:”

86. To the extent the preamble is considered limiting, in my opinion, Nagata discloses and/or suggests the preamble. Nagata discloses a “wireless display system” that “performs communication” between a server 10, “portable terminal” such as a remote control 80 or smart phone 180, electronic rack labels 40, and an access point 30. *Nagata*, Abstract, [0005], [0035]. Figure 1 depicts Nagata’s wireless display system, provided here:

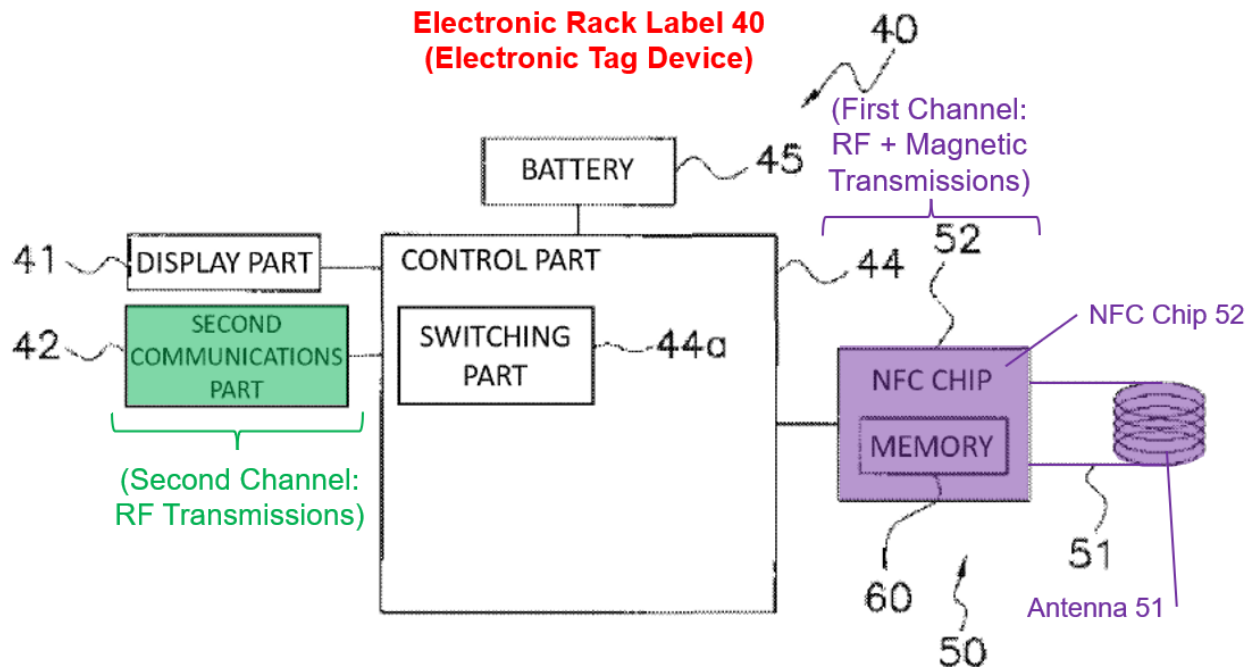


Id., Fig. 1, [0211]. Each electronic rack label 40 displays at least product (“Potato Chips”) and price (Yen) information as shown in Figure 3, provided here:



Id., Fig. 3, [0024].

87. In my opinion, a POSITA would have recognized Nagata's electronic rack label as an electronic tag device because it displays electronic price information for an item, which is consistent with an "electronic price tag . . . tag device" as disclosed by the '216 patent. *'216 Patent*, 1:23–25. A POSITA would have also understood Nagata's electronic rack label is an interactive electronic tag device because it exchanges wireless information ("interact[s]") with remote control 80 or smart phone 180 using a first communications part 52 containing a radio-frequency (RF) tag for performing near-field communications (NFC) to, e.g., transmit to the electronic rack label instructions from the smartphone or remote control to receive at the remote control or smart phone information from the electronic rack label. *Nagata*, [0051]–[0060]. A POSITA would have also recognized Nagata's electronic rack label exchanges wireless information (e.g., "interacts") through a second communications part 42 with server 10 via an access point 30 using radio wave transmissions to, e.g., change the display on the electronic rack label. *Id.*, [0061]–[0064]. My annotated version of Figure 5, which I provide here, identifies these elements:



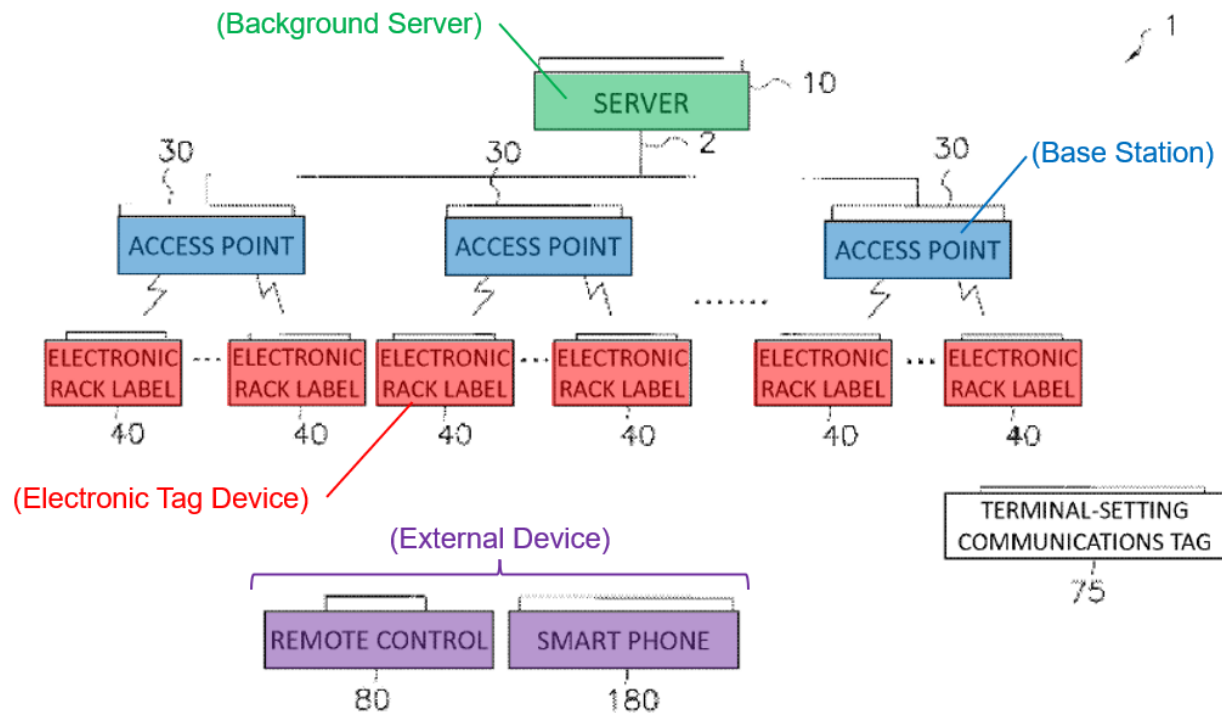
Id., Fig. 5, [0049].

88. Accordingly, it is my opinion that Nagata discloses or suggests a wireless display system comprising a server, access points, smart phone, and electronic rack labels for communicating retail product information (“interactive electronic tag device communication system”).

b. Claim 1.1: “a background server, a base station, an electronic tag device and an external device;”

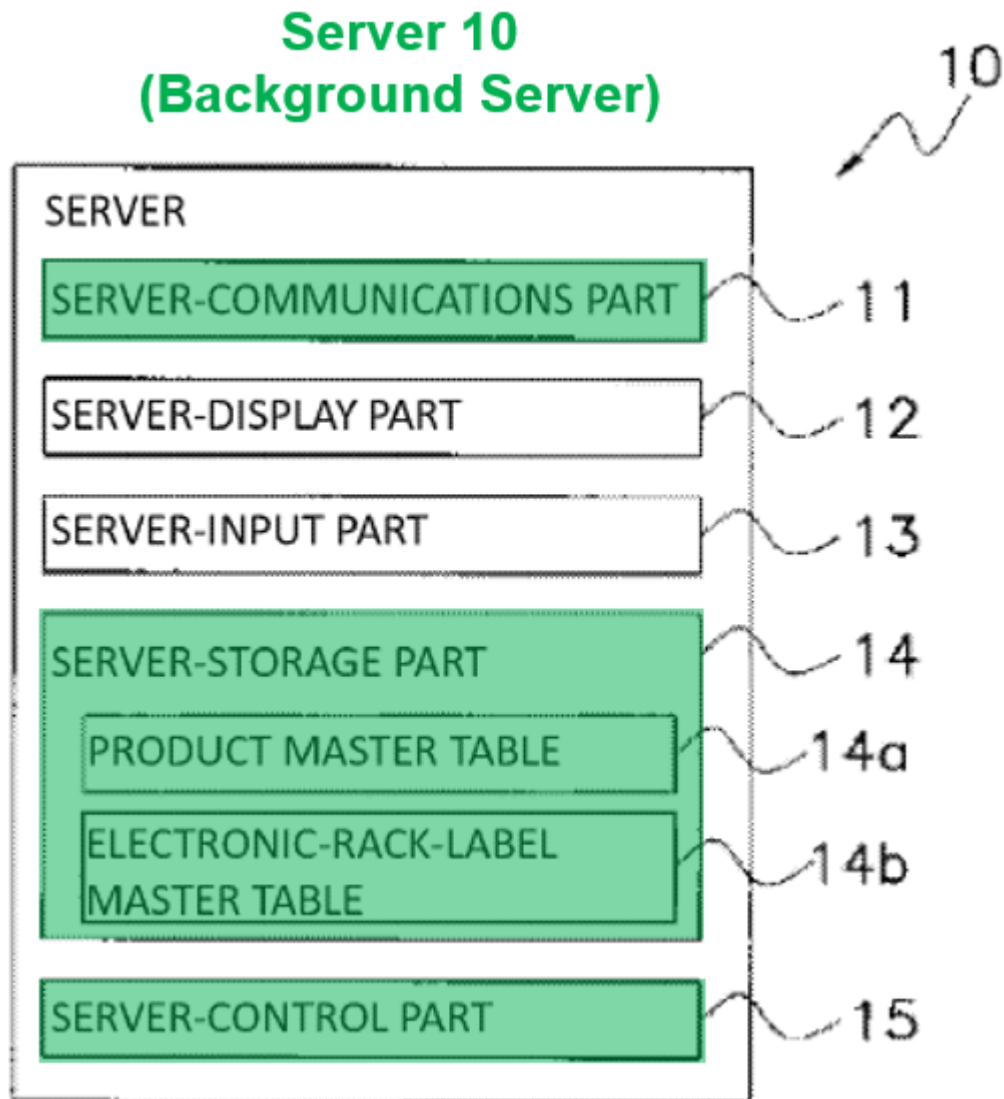
89. In my opinion, Nagata discloses and/or suggests this limitation. As I explained with respect to claim limitation 1.0, above, Nagata’s wireless display system 1 (“interactive electronic tag device communication system”) performs communications between a server 10 (“background server”), portable terminal, i.e., remote control 80 or smart phone 180 (“external device”), electronic rack labels 40

(“electronic tag device[s]”), and an access point 30 (“base station”). *Nagata* Abstract, [0005], [0035]. My annotated version of Figure 1, which I provide here, depicts these components:



Id., Fig. 1, [0027].

90. The server 10 includes server-communications part 11, server-storage part 14, and server-control part 15 to manage, store, and communicate tabularized product information associated with electronic rack labels to and from those labels as I show in my annotated version of Figure 6, which I provide here:

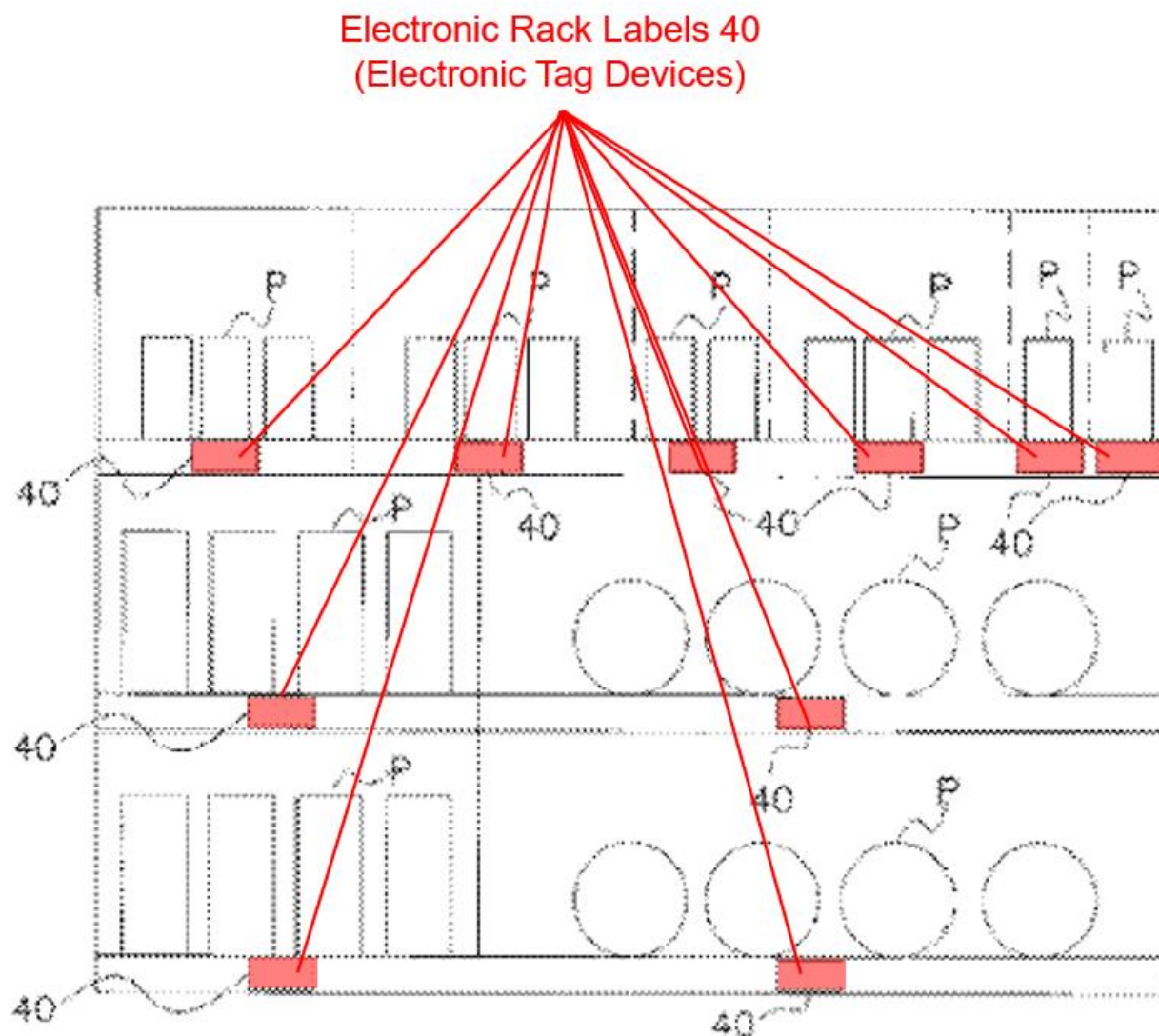


Id., Fig. 6, [0088]–[0091] (“Server-Communications Part”), [0094]–[0101] (“Server-storage part” with “Product Master Table” and “”electronic-Rack-Label Master Table”). The server may be located in “the server room of the store in which the wireless display system 1 is installed,” and further exchanges product information with the electronic rack labels using a network with access points 30. *Id.*, [0030], [0087].

91. Each of the access points 30 is a “communications apparatus” that transmits information between the electronic rack labels 40 and server 10 using “radio-wave-type wireless communication” and is mounted on a store ceiling as a predetermined spacing interval from other access points. *Id.*, [0031]–[0032]. Each of the labels may communicate with any of the access points. *Id.*, [0032]. A POSITA would have recognized Nagata’s access points as base stations because they receive and transmit information between the electronic rack label and server in the same manner as the “base stations” transmit and receive information between the tag and background server in the ’216 patent. *Compare Nagata*, [0031] (disclosing each access point transmits and receives information via radio wave between electronic rack labels and the server) *with ’216 patent*, 2:33–34 (“the base station is configured to receive the first data and transmit [it]... to the background server”). Additionally, just as the ’216 patent’s base station utilizes a radio frequency path to communicate with the tag and server, so do Nagata’s access points. *Compare ’216 patent*, 4:31–41 (“The first communication path (channel 1) is a 2.4 G RF (Radio Frequency) path”) *with Nagata*, [0031] (“Each of the access points 30 is a communications apparatus that performs radio-wave-type wireless communication”).

92. Nagata’s battery-powered electronic rack labels 40 are installed on store shelves and each one includes a display and communications parts to show certain product related information, the retail price of that product, a unique product

identification barcode, and update that information in communications between a smartphone and the server via access stations as displayed in my annotated version of Figure 2, which I provide here:



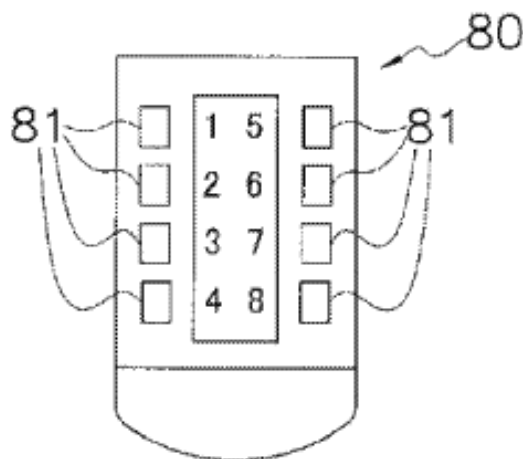
Nagata, Fig. 2, [0024], [0028]–[0029].

93. As I described in claim limitation 1.0, above, Nagata’s electronic rack labels exchange wireless information (i) directly with remote control 80 or smart phone 180 using a first communications part 52 containing a radio-frequency (RF)

tag for performing near-field communications (NFC) to, e.g., transmit product information to a smartphone upon request and (ii) with server 10 via an access point 30 using radio wave transmissions. *Id.*, [0051]–[0064]. My annotated version of Figure 5, which I provide here, identifies these elements:

Id., Fig. 5, [0049].

the display of product inventory quantity, sales count, or affiliated allergic information:



Id., Fig. 7, [0037]–[0039], [0125].

95. A customer smart phone also communicates with the electronic rack label using near-field communications. *Id.*, [0044]–[0046]. The customer can use the smart phone to query product information stored in the electronic rack label for viewing on the smart phone using a uniform resource locator (“URL”), such as allergic food substances in the product, its retail price, any bargain or tax rate or discount information. *Id.*, [0058], [0070]–[0073].

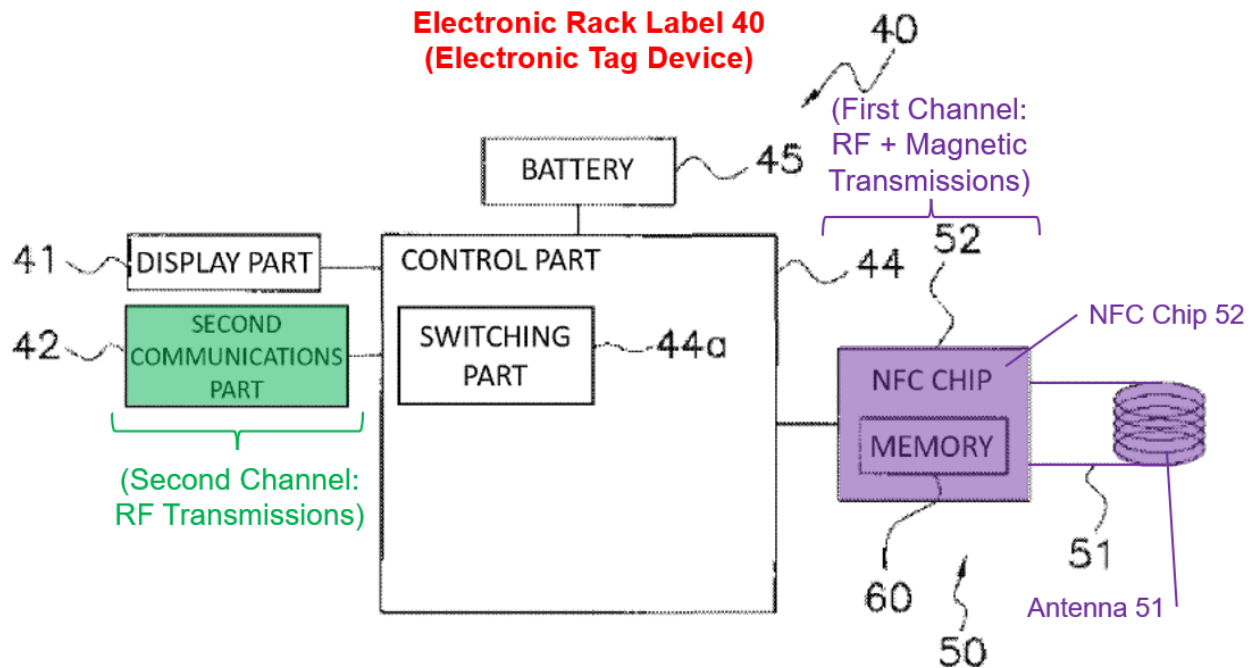
96. A POSITA would have understood Nagata’s portable terminal, embodied as either remote control 80 or smart phone 180, as “external devices” because they operate in the same manner as the “external devices” in the ’216 patent. For example, Nagata’s portable terminals can be used to initiate a change in the display of product inventory quantity, sales count, affiliated allergic information,

turn communication on or off, or view information stored in the label about the product. *Id.*, [0037]–[0039], [0044], [0058], [0125]. In the same way, “[t]he electronic tag device [of the ’216 patent] performs a data interaction with external devices ... to transmit data (including screen update, data update, device control, status change, etc.) to the electronic tag device and receive data (such as device status information query, read public area data, read private area data, etc.).” *’216 patent*, 4:44–50.

97. Accordingly, it is my opinion that Nagata discloses or suggests a wireless display system that exchanges wireless information in communications between a server 10 (“a background server”), access points 30 (“base station[s]”), electronic rack labels 40 (“electronic tag device[s]”) and a remote control 80 or smart phone 180 (“external device”).

c. Claim 1.2: “wherein the electronic tag device comprises two communication paths: a first communication path and a second communication path;”

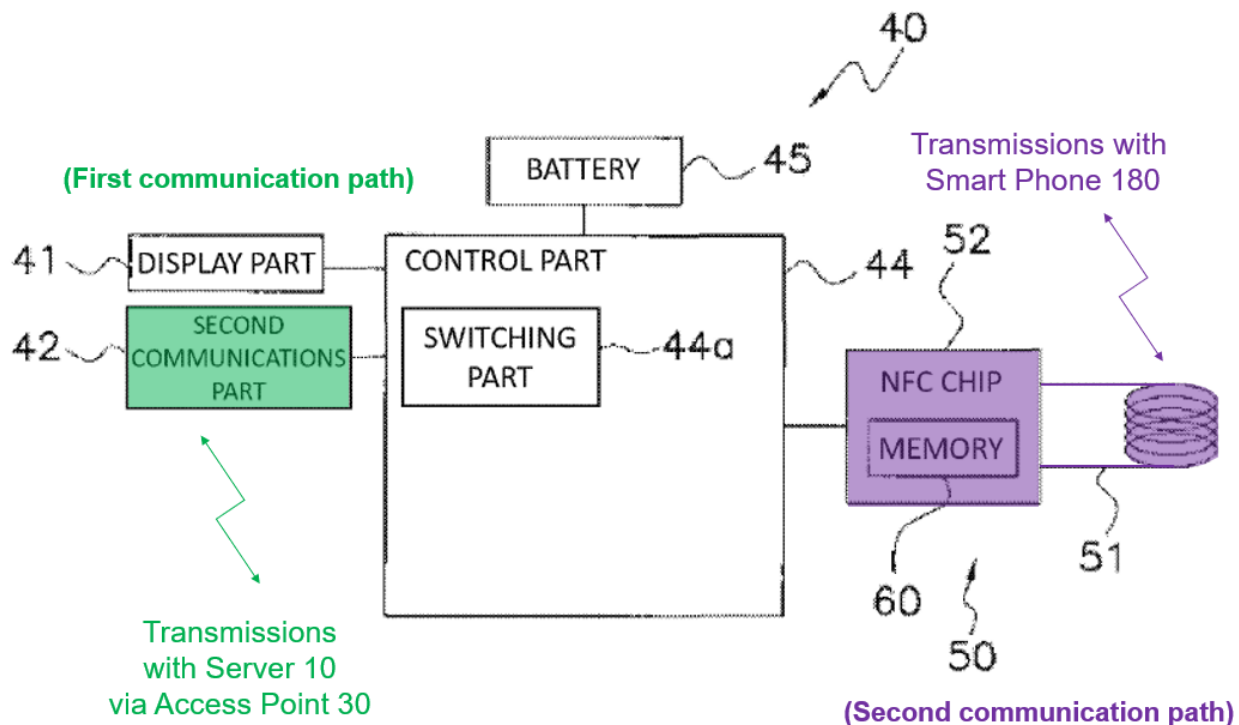
98. In my opinion, Nagata discloses and/or suggests this limitation. As I explained with respect to claim limitation 1.0, above, Nagata’s electronic rack labels include a first communications part 50 and second communications part 42 as displayed in my annotated version of Figure 5, which I provide here:



Nagata, Fig. 5, [0049]. The first communications part 50 of electronic rack label 40 wirelessly communicates product information associated with the label to smart phone 180 over radio waves and magnetic fields using NFC chip 52. *Id.*, [0051]–[0060]. First communications part 50 further receives instructions and power from remote control 80 and/or smart phone 180 to control the label and can transmit information stored in the label to the smart phone. *Id.*, [0051]–[0053]. The electronic rack label’s second communications part 42 wireless communicates, e.g., display commands with server 10 via access point 30 using “radio-wave type wireless communications. *Id.*, [0061]–[0066].

99. A POSITA would have thus recognized Nagata’s electronic rack labels each contain two distinct communications paths corresponding to each of the label’s two separate communications parts so that each label can clearly and distinctly

communicate specific information with respect to its source or destination; the label communicates *information* with the server using wireless radio signals (green path), but both *information* and *power* are sent to the electronic rack label from a remote control or smart phone (purple path) to the label using both radio signals and magnetic fields as required by the first communication part's unique inclusion of NFC chip 52 and antenna 51. *Id.* I highlight the two communication paths in my annotated version of Figure 5, which I provide here:



Id., Fig. 5.

100. A POSITA would have further recognized Nagata's two communication parts and respective channels as the two separate and distinct channels depicted in the '216 patent on either side of the electronic tag device, which

communicate with the server (green) and external device (purple) as annotated in my annotated version of Figure 3 that I provide here:

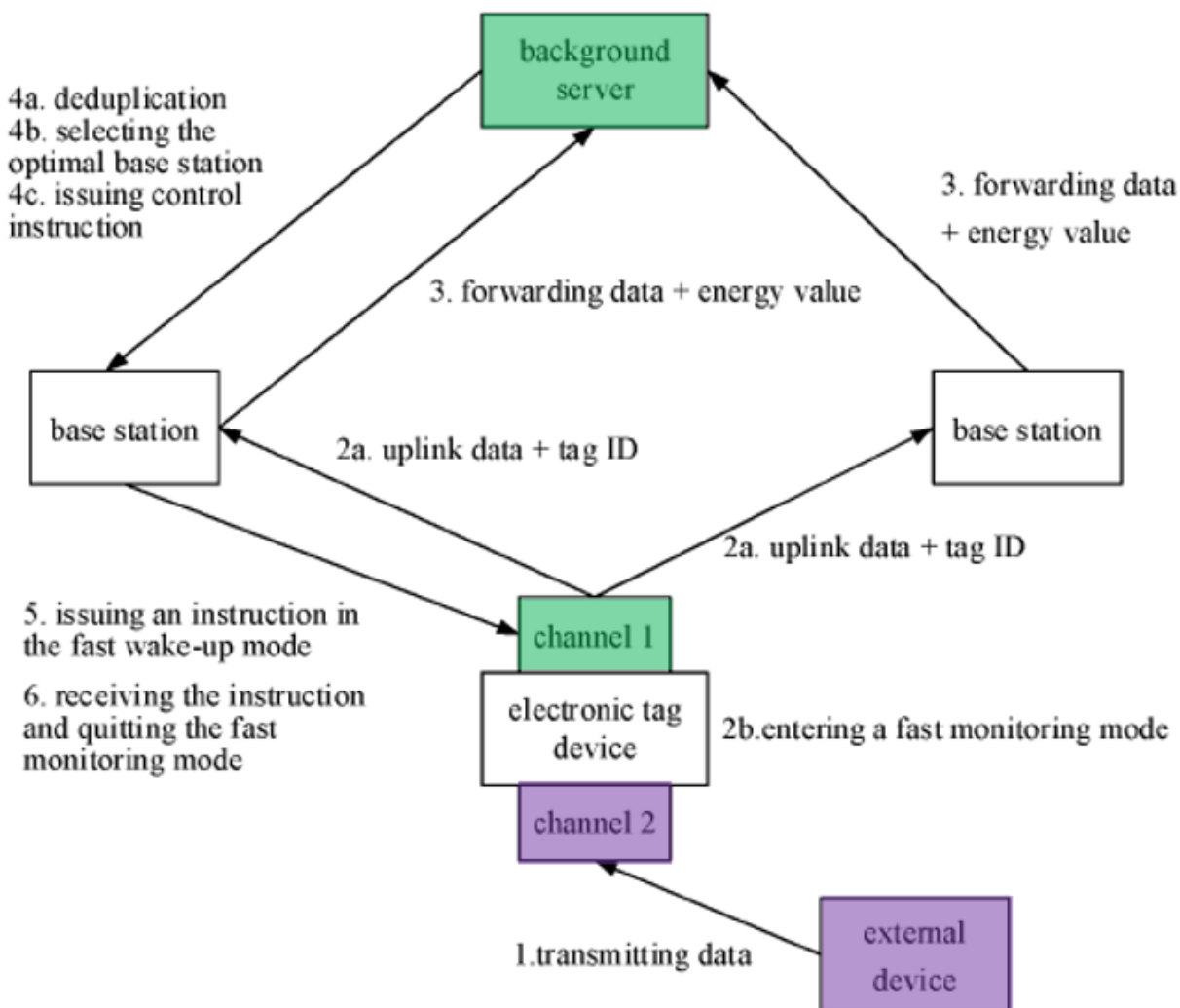


FIG. 3

'216 patent, Fig. 3. Specifically, “channel 1” shown above provides communication to a server (through a base station) using “a 2.4 G RF (Radio Frequency) path” ('216 patent, 4:31–34), while “channel 2” provides communication with an external device using “a magnetic switch, an NFC switch, an infrared switch,” or other means (*id.*, 4:41–44). Thus, a POSITA would have recognized Nagata’s second

communications part 42 corresponded to and operated the same as the '216 patent's "channel 1" (i.e., claimed "first communication path), and that Nagata's first communications part 50 corresponded to and operated the same as the '216 patent's "channel 2" (i.e., claimed "second communication path).

101. Accordingly, it is my opinion that Nagata discloses or suggests each electronic rack label ("electronic tag device") includes a second communications part that wirelessly exchanges information over radio waves with a server ("first communications path") and a first communications part with an NFC tag that wirelessly exchanges information using radio signals and magnetic fields ("second communications path") with a remote control or smart phone ("external device").

d. Claim 1.2.1: "the first communication path supports two monitoring modes: a normal monitoring mode and a fast monitoring mode;"

102. In my opinion, Nagata discloses and/or suggests this claim limitation. Nagata's labels include a "switching part" that switches the operation of the second communications part from a "sleep state" to an "awake state" to communicate with an access point. *Nagata*, Abstract, [0005]. The time and duration of the awake state can be adjusted to conserve battery power of the label (low power) or communicate quickly with the access point (high power). *Id.*, [0029], [0081]–[0083], [0115]–[0116].

103. From my review, Nagata's system configures two parameters: (i) an interval at which the label automatically switches between the sleep (low power mode) and awake (high power mode) state, and (ii) the duration the label will remain in the awake state (e.g., duration of high power mode). *Id.*, [0082]–[0083]. For example, it is disclosed that the label's second communications part may be *normally* set to wake for one second once every minute. *Id.*, [0083]. But it is also disclosed that the second communications part may be set to be awake for 30 seconds following communication from the remote control or smart phone. *Id.*, [0115]–[0116]. The second communications part may therefore be maintained in a prolonged active state after the label has received information from the remote control (or phone). *Id.*, [0113]–[0116]. Also, the awake state may be prolonged (e.g., for an additional 30 seconds) when the second communications part receives a beacon from the access point during the awake state. *Id.*, [0033], [0083].

104. A POSITA would have recognized Nagata's label has at least two monitoring modes through the second communications part 42 and its respective communications path: (i) a monitoring mode that operates in accordance with a relatively short prescribed duration at elongated intervals (e.g., once every minute for one second), with slower communications because the access point must wait to communicate with the electronic rack label until the next waking period; and (ii) a monitoring mode where the second communications part may enter and maintain the

awake state to keep the path active for faster communications that avoid the delay of waiting for the next interval to start. *Id.*, [0029], [0083].

105. A POSITA would have recognized Nagata's monitoring modes teach the recited "normal monitoring mode" and "fast monitoring mode" because even though the '216 patent does not expressly explain "normal" and "fast" monitoring, it does explain the electronic tag device may have a "monitoring period" and "wake up duration" that can be changed based on the speed of communication with the base station. '216*Pat*, 1:23–65. Therefore, a POSITA would have understood faster communication could be achieved by either shortening the monitoring period or lengthening the wake-up duration.

106. Thus, a POSITA would have recognized Nagata's monitoring mode with a longer prescribed time interval (i.e., period) and shorter awake time (i.e., wake-up duration) teaches the '216 patent's "normal monitoring mode" because battery power would be conserved in the label's normal state. A POSITA would have also recognized Nagata's monitoring mode operating for an increased duration of time and/or at an increased frequency of awake time teaches the '216 patent's "fast monitoring mode" because the label would consume more power while communicating faster with the access point.

107. Accordingly, it is my opinion that Nagata discloses or suggests that the label's second communications part (between access point and an electronic rack

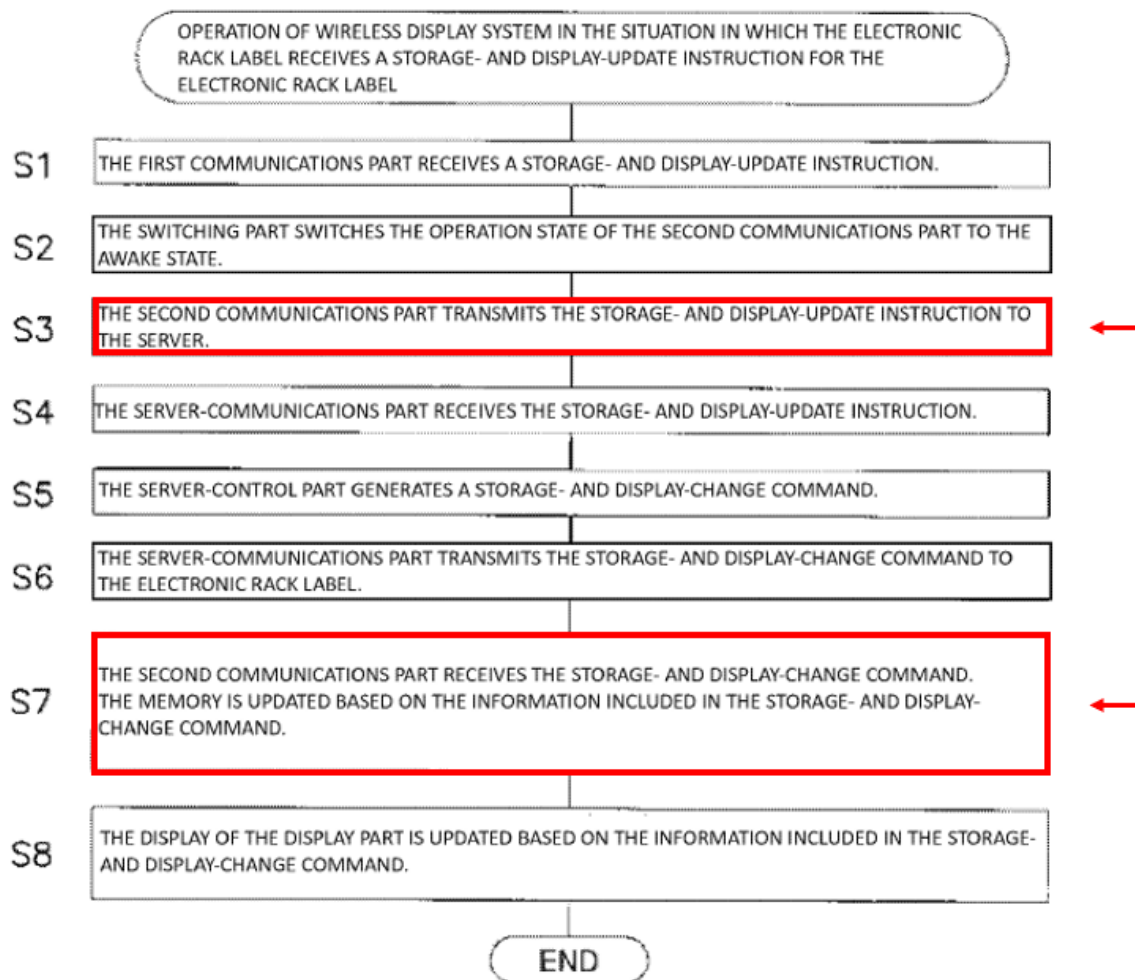
label operates in both a prescribed time-delay awake mode (“normal monitoring mode”) and longer awake mode (“fast monitoring mode”), and that it would have been obvious to a POSITA to wake up the second communications part at a smaller frequency (e.g., more often) to increase the rate of its communications.

e. Claim 1.2.2: “and the base station comprises two wake-up modes: a normal wake-up mode and a fast wake-up mode;”

108. In my opinion, Nagata discloses and/or suggests this limitation. Nagata’s labels have a second communications part that operates in at least a normal and fast monitoring mode as I explained above in claim limitation 1.2.1. The access points communicate information to the labels from the server (and vice versa) while the labels are in those monitoring modes but cannot communicate with the labels unless the labels are in an awake state. *Nagata*, [0005], [0029], [0031]. Thus, a POSITA would have understood the access points operate in a coordinate mode with the labels because the access points can only communicate with the labels when the labels are awake in those modes. Specifically, Nagata’s access points have modes corresponding to the labels’ modes so they can exchange transmissions. *Id.*, [0033] (“each of the access points 30 transmits at a prescribed-time interval a signal called a beacon ***timed to when the operation state of the second communications parts 42 of the electronic rack labels 40 becomes the awake state***”) (my emphasis added).

109. Nagata’s access points receive instructions from a remote control or smart phone via the labels. *Id.*, [0115]–[0117]. The access points transmit the

instructions to a server, which generates and transmits a command back to the access points. *Id.*, [0117]–[0121]. The access points transmit beacons to the labels at coordinated, prescribed time intervals matching those of the label’s mode to indicate the presence or absence of more information for subsequent transmission to the label (i.e., via the “first communications path”). *Nagata*, [0033]. My annotated version of Figure 8 shows where the access points transmit (i) label-provided instructions to a server (S3), and (ii) beacons and/or server-provided commands back to labels (S6), which I provide here:



Nagata, Fig. 8, [0114]–[0124] (“Storage- and/or Display-Update Instruction” from smart phone or remote control), [0033] (describing access point beacon transmission from access point to label).³

110. When a remote control or smart phone sends a “storage- and/or display-updated instruction” or “display-switch instruction” to the label (e.g., a store employee wishing to change product information displayed by the label for a product) via the second communications path 42, the label switching part switches the second communications part into the longer duration awake state (“fast mode”). *Id.*, [0113]–[0116], [0128]. That instruction is then sent to the access points. *Id.*, [0117], [0129].

111. Therefore, a POSITA would have recognized *Nagata*’s label-server communications through the access points require system-wide timing that causes the access points to switch into an active state (“wake up”) at different rates of communication (“normal” and “fast”) according to the rate of communications of the labels to avoid wasted power and transmissions. *Nagata*, [0005], (describing how

³By my review, the Figure 8 and 9 embodiments are nearly identical. *Compare Nagata*, Fig. 8, [0114]–[0124]; *with id.*, Fig. 9, [0125]–[0135]. For purposes of forming my opinions, I do not combine these embodiments, but rather rely upon them independently.

the label can only communicate with the access point when it is in an awake state), [0033] (describing how access point beacon transmissions follow the label timing, and prevent label from “immediately return[] to sleep” when the beacon indicates a server command will follow it), [0083] (describing same and preventing the label from returning to sleep for 30 seconds), [0065] (describing a response signal (ACK) transmitted from a label back to the access point after receipt of server-generated information to confirm receipt and implementation of the server command); [0111] (describing re-transmission of a server command to rack label when the server receives no label-generated response signal); *see also Laroia*, 2:33–50 (“By reducing base station transmissions in terms of frequency and/or power level, interference with communications in neighboring cells can be reduced...for improved throughput in a multi-base station system where transmissions by adjoining base stations can interfere with each other”).

112. Further, as I explained above in claim limitation 1.2.1, transmissions between Nagata’s access points and labels are all exchanged via a “radio-wave-type wireless communication” channel (“first communication path”) using each label’s RF-type “second communications part 42.” *Nagata.*, [0031], [0033]. Although Nagata does not specifically describe the network standard for communication, a POSITA would have found it at least obvious to utilize well-known and widely used standard networks codified by the Institute of Electrical and Electronics Engineers

(commonly known as “IEEE”), such as the IEEE 802.15.4 and/or ZigBee™, because those standards were specially and technically tuned to connect widely distributed, network-connected low-energy Bluetooth devices to a server using the unlicensed 2.4GHz Industrial, Scientific and Medical (ISM) radio frequency band.

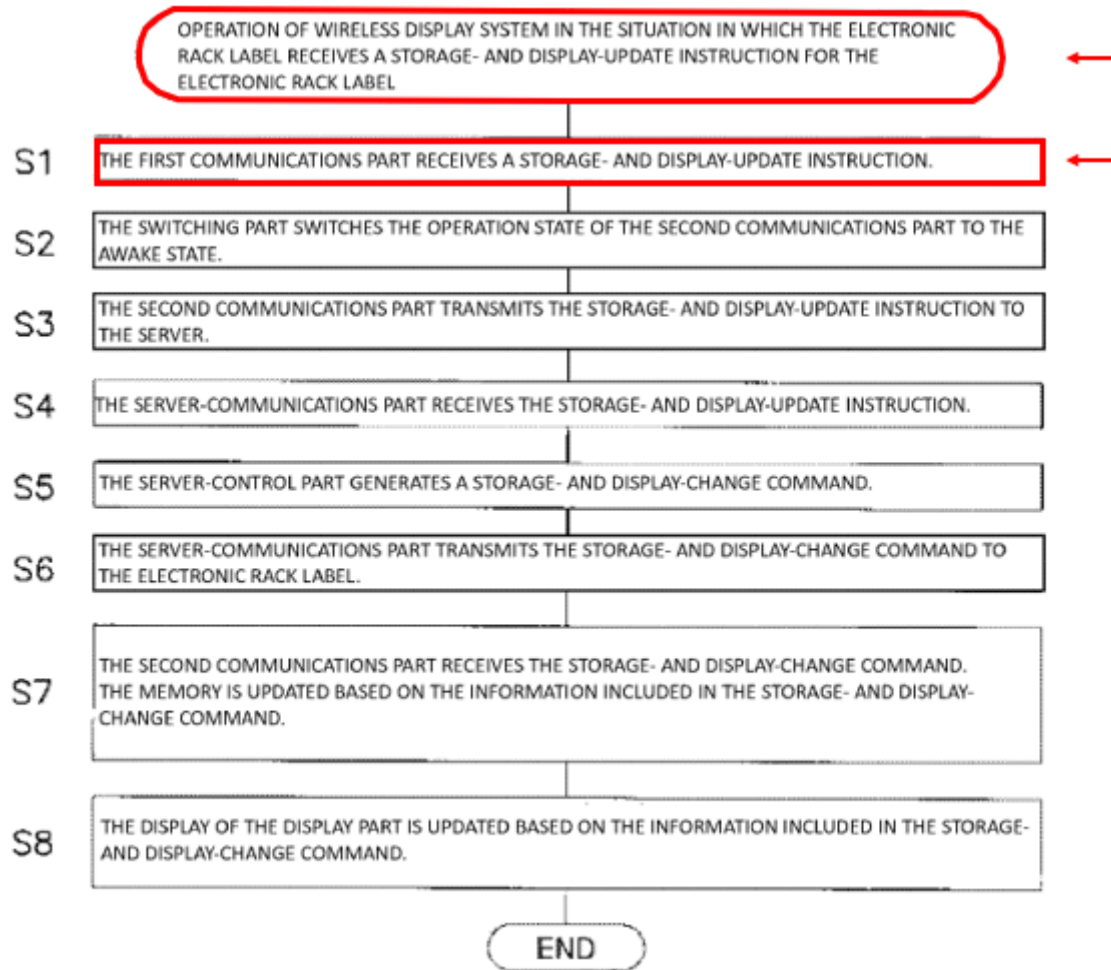
113. For example, Weiyang (Ex. 1017) describes the IEEE 802.15.4 (Zigbee) standard as a low cost and low power short-range wireless communication standard. *Weiyang*, § 1. Cook (Ex. 1018) also describes a 2.4GHz transceiver useful for low-power network use in multi-year lifetime battery mesh network applications. *Cook*, §§ I–II. The Bluetooth Specification describes using the 2.4 GHz unlicensed band for Bluetooth devices. *Bluetooth*, 257. A POSITA would have therefore looked to Bluetooth to determine additional modifications and enhancements useful for improving this architecture, and one critical advantage offered in this type of network offers is dynamic, incremental power management to conserve label battery power drain and improve connectivity and communicability between two devices, but only if *both* devices using the channel support that feature power control. *Id.*, 533. Specifically, communication power in this type of channel can be managed carefully to improve the connection and communicability of a node-type device with another device in this type of network, but only if *both* the devices support the feature. *Id.*, 533–536. Therefore, a POSITA would have recognized that both Nagata’s access point (device 1) and electronic rack label (device 2) would have

used power-managed communication modes to attain the improved connection and communication commonly offered in this type of network.

114. Accordingly, a POSITA would have recognized that the access point (“base station”) adheres to a first wake-up mode (“normal wake-up mode”) compatible with that of the electronic rack label in which both operate to communicate normally at a low-power, prescribed time interval.

f. Claim 1.3: “the external device is configured to transmit first data to the electronic tag device through the second communication path;”

115. In my opinion, Nagata discloses and/or suggests this limitation. As I explained with respect to claim limitations 1.1 and 1.2.2, above, a remote control user (e.g., employee) or smart phone user (e.g., customer) transmits an instruction to the first communications part (i.e., “second communications path”) of the electronic rack label using NFC transmission. *Nagata*, Fig. 1 (40, 80, 180), [0038], [0044], [0052], [0114]–[0115]. This step is highlighted in my annotated version of Figure 8, which I provide here:

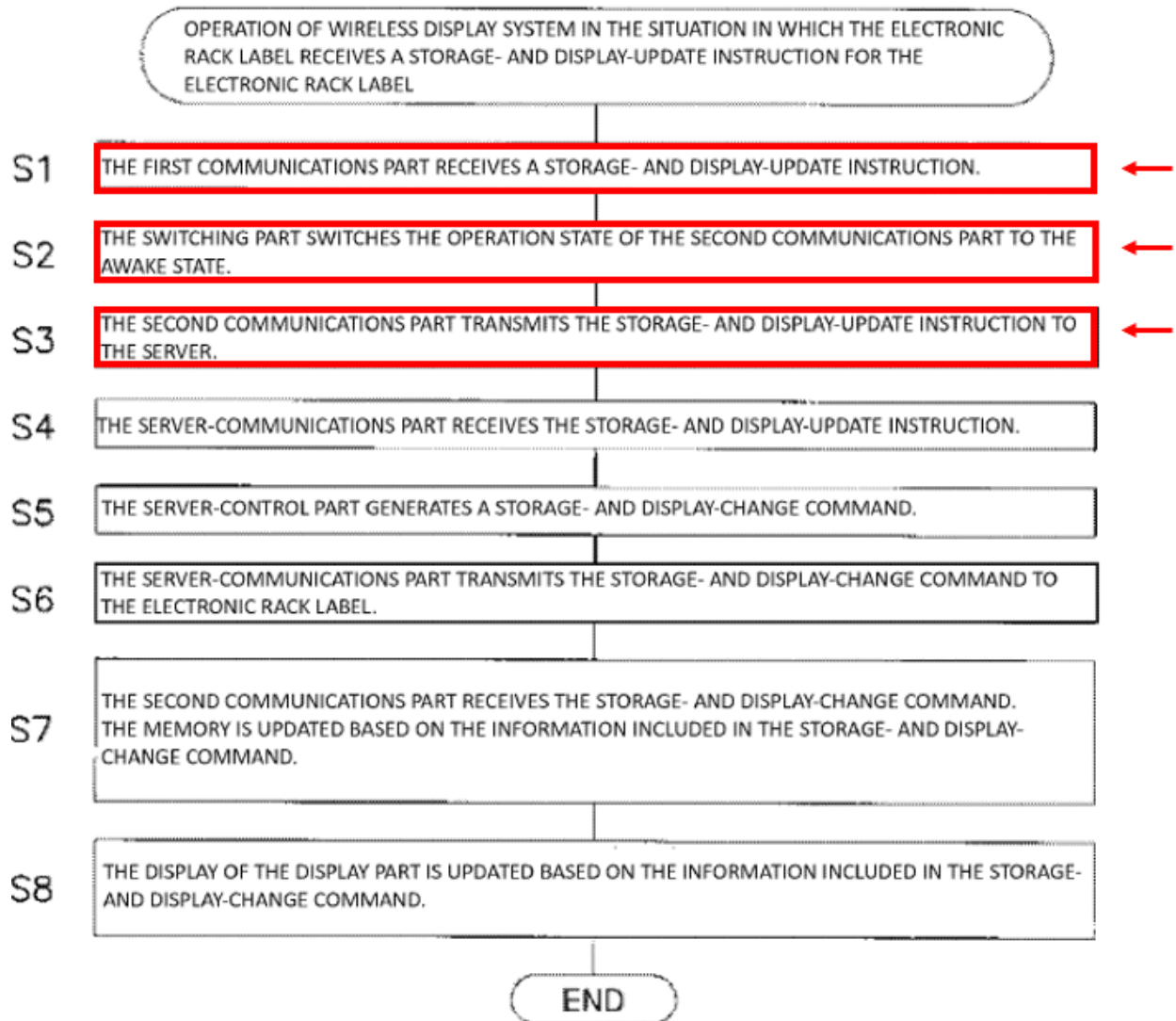


Id., Fig. 8 (S1), [0114–0115], Fig. 9 (S11), [0125]–[0127]. The remote control- or smart phone-transmitted instructions correspond to the claimed “first data.”

116. Accordingly, it is my opinion that Nagata discloses or suggests the remote control or smart phone (“external device”) transmits an instruction (“first data”) to the electronic rack label (“electronic tag device”) through NFC transmissions to its first communications part (“second communication path”).

- g. Claim 1.4: “the electronic tag device is configured to receive the first data, transmit the first data to the base station through the first communication path, and enter the fast monitoring mode;”**

117. In my opinion, Nagata discloses and/or suggests this limitation. As I previously explained, Nagata’s electronic rack label receives, e.g., a storage- and/or display-update instruction or display-switch instruction transmitted by, e.g., an employee or customer using the remote control or smart phone, respectively, with near-field communications. *Nagata*, Abstract, [0051]–[0052], [0114]–[0115], [0125]. The electronic rack label receives the instruction information from the remote control or smart phone via NFC communications using at least NFC chip 52. *Id.*, [0057]. The label then transmits the received instruction data to the server via an access point (i.e., “base station”). *Id.*, [0064], [0066]. To do so, the label’s control part 44 receives a signal from the first communication part and switches the second communications part to transmit that instruction to the server via the access point and maintains that active state either until the second communications part receives a command back from the server or for a longer interval prescribed by the faster monitoring mode (e.g., 30 seconds instead of one second). *Id.*, [0057], [0079–[0080], [0116]–[0117], [0128]–[0129]. These steps are highlighted in my annotated version of Fig. 8, which I provide here:



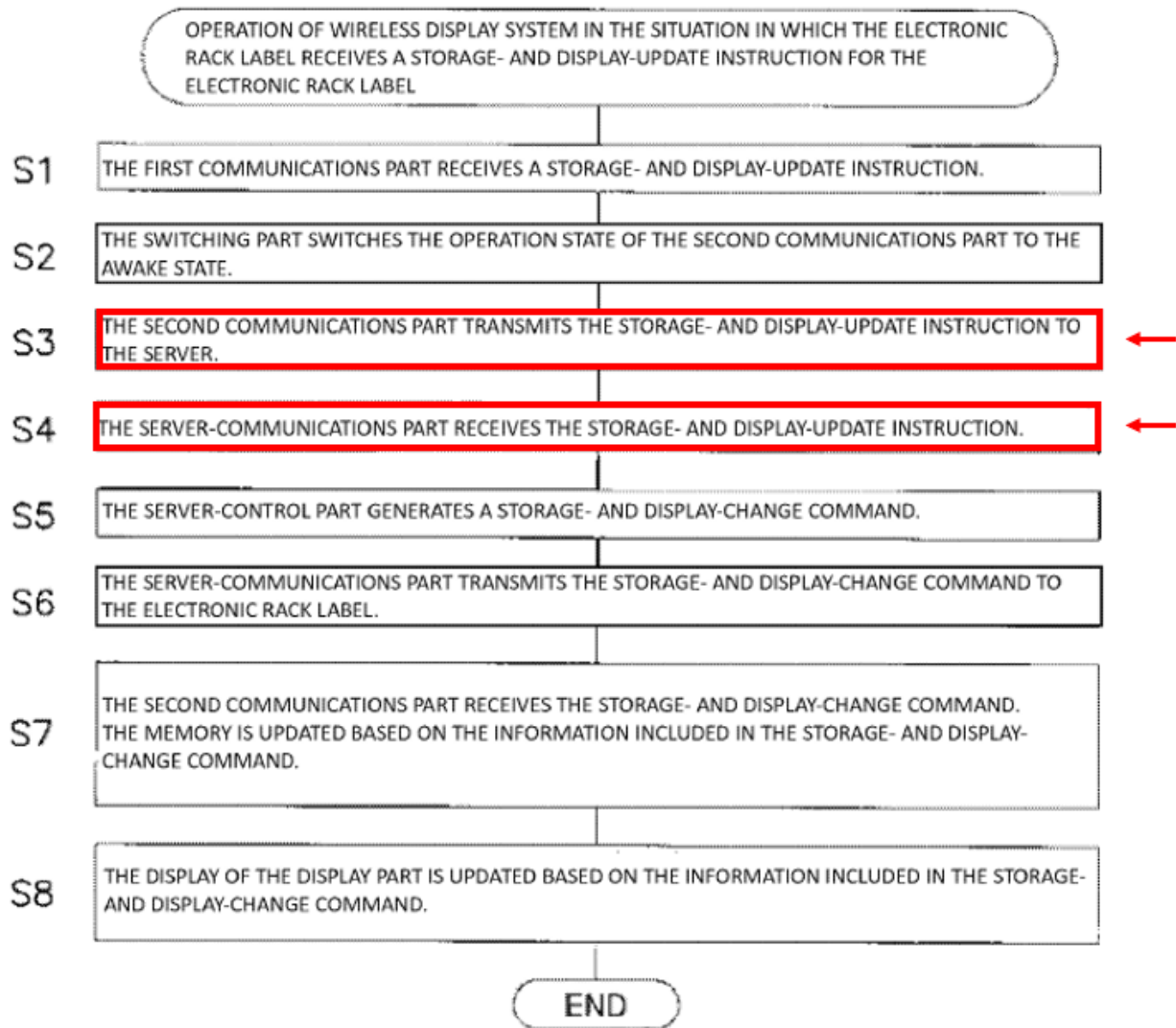
Id., [0115]–[0117], Fig. 8 (steps S1–S3); [0125]–[0129], Fig. 9 (steps S11–S13), [0127]–[0129].

118. Accordingly, it is my opinion that Nagata discloses or suggests an electronic rack label 40 (“electronic tag device”) receives a remote control or smart phone-initiated instruction (“configured to receive the first data”), then switches the second communication part into a longer awake state (“enter the fast monitoring

mode”) to communicate the instruction to the server via an access point (“transmit the first data to the base station”).

h. Claim 1.5: “the base station is configured to receive the first data and transmit the first data to the background server;”

119. In my opinion, Nagata discloses and/or suggests this limitation. As I explained with respect to claim limitations 1.1 and 1.4, above, each electronic rack label “exchanges information with the server via the access point.” *Nagata*, Abstract. Specifically, the access point 30 receives an instruction transmitted by the electronic rack label second communications part, which it then transmits to the server. *Id.*, [0117]–[0118], [0128]–[0129]. Server 10 only communicates directly with access points 30 and does not communicate directly with the labels; thus, all data transmitted or received by the labels passes through access points 30. *Id.*, [0089]. As highlighted in my annotated version of Fig. 8, which I provide here, the originating user instruction is transmitted via the access point to the server (step S3) and the server receives that instruction (S4):



Id., Fig. 8 (steps S3 (showing transmission via access point to server), S4), [0117] (“[I]n step S3, the control part 44 of the electronic rack label 40 controls the second communications part 42 so that the second communications part 42 transmits, to the server 10 **via the corresponding access point 30**, the storage- and display-update instruction stored in the memory 60.”) (my emphasis added), Fig. 9 (S13 and S14), [0129] (“[I]n step S13, the control part 44 of the electronic rack label 40 controls the second communications part 42 so that the second communications part 42

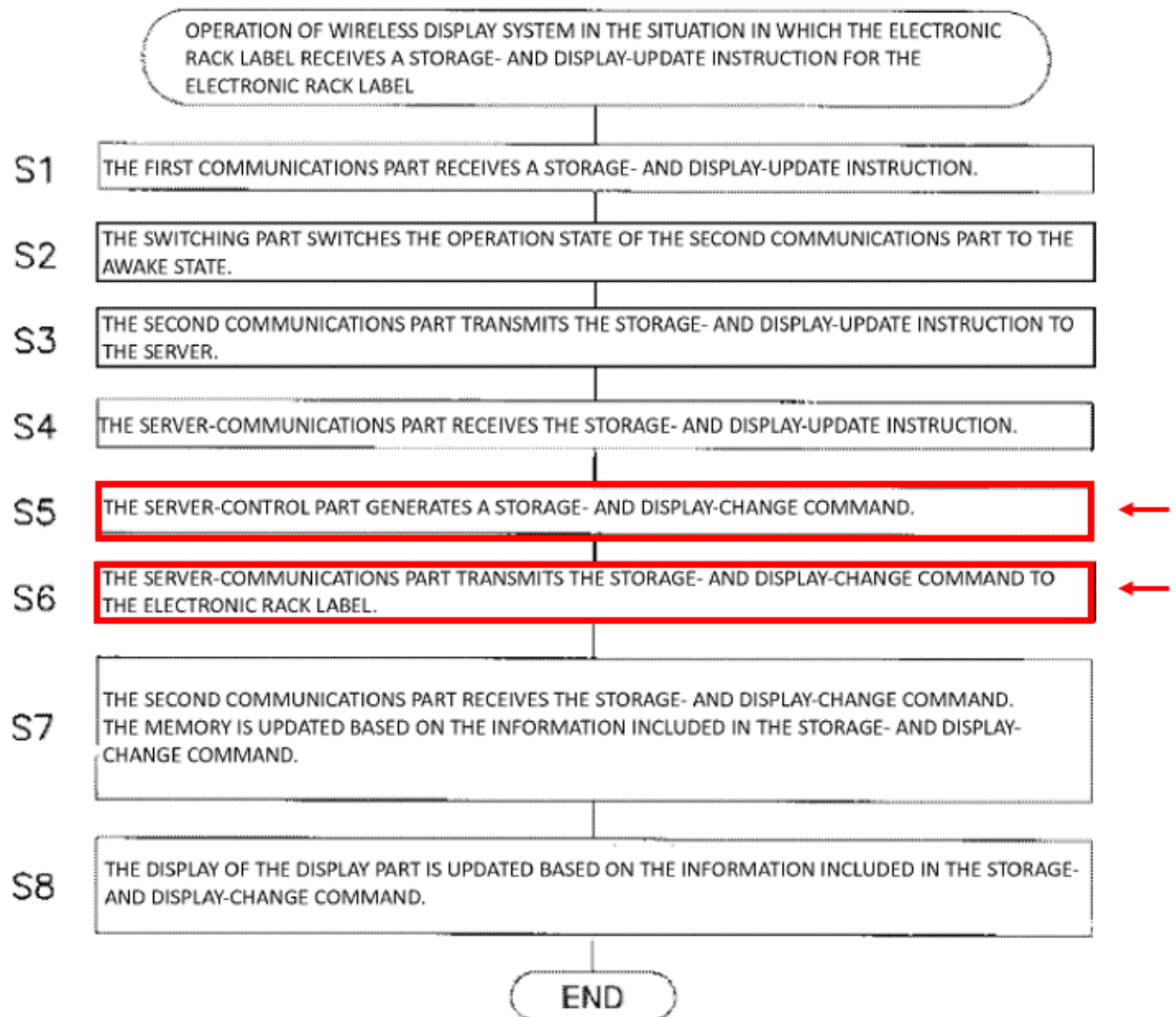
transmits, to the server 10 *via the corresponding access point 30*, the display-switch instruction stored in the memory 60.”) (my emphasis added).

120. Accordingly, it is my opinion that Nagata discloses or suggests transmitting the instruction from the remote control or smart phone (“first data”) to the server (“background server”) through an access point (“base station” that “receive[s]” to “transmit”).

- i. **Claim 1.6: “the background server is configured to generate a control instruction and second data according to the first data, and transmit the control instruction and the second data to the base station;”**

121. In my opinion, Nagata discloses and/or suggests this limitation. Upon receipt, the server “generates a storage- and display-change command” using the “server-control part” of the server to process the instruction and generate a storage- and display-change command instruction with respect to the appropriate data stored in the “electronic-rack-label master table” and “product master table” at the server. *Nagata*, [0119]–[0120], [0131]–[0132]. Specifically, the server generates “image data” that includes “product information related to the product P to be displayed on the display part” with respect to the electronic rack label associated with an identified product P. *Id.*, [0120], [0132]. Subsequently, the server generates a command that includes the image data and transmits the command (with image data) back to the access point for transmission back to the respectively identified electronic rack label. *Id.*, [0120]–[0121]. A POSITA would have understood Nagata’s server-generated

command to be the “control instruction” and the image data to be the “second data” recited in the claim because the label uses the command and image data to update its display. *Compare '216 patent* 4:38–41 (“the control instruction and data include screen update, data update, device control, status change, and device status information query and the like”) *with* Nagata, [0123] (“the display part 41 is updated based on the information (image data...) included in the storage- and display-change command.”), [0134]. My annotated version of Fig. 8 shows these steps, which I provide here:

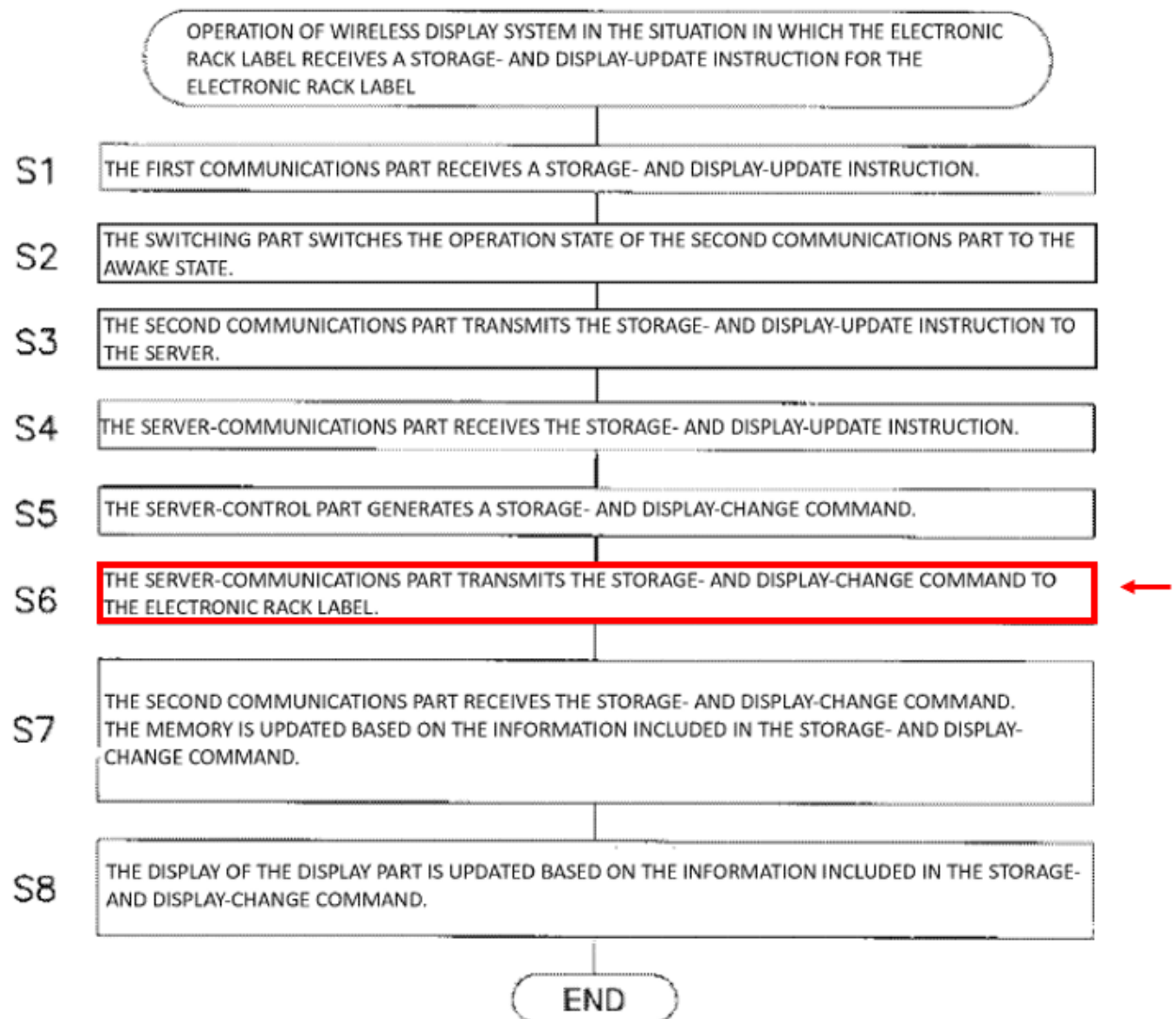


Id., Fig. 8 (steps S5, S6), [0121] (“[I]n step S6, the server-control part 15 of the server 10 controls the server-communications part 11 so that the storage- and display-change command generated by the server-communications part 11 is transmitted to the electronic rack label 40 **via the corresponding access point 30.**”) (my emphasis added), Fig. 9 (steps S15, S16), [0133] (“The processes in step S16 and step S17 are the same as the processes in the above-mentioned step S6 and step S7, and therefore explanations thereof are omitted.”).

122. Accordingly, it is my opinion that Nagata discloses or suggests a server (“background server”) generates a storage- and display-change command (“control instruction”) including image data (“second data”) that is transmitted back to the electronic rack label through an access point (“base station”).

- j. **Claim 1.7: “the base station is further configured to receive the control instruction and the second data, communicate with the electronic tag device in the fast wake-up mode, and transmit a fast wake-up instruction, the control instruction and the second data to the electronic tag device through the first communication path; and”**

123. In my opinion, Nagata discloses and/or suggests this limitation. As I explained with respect to claim limitation 1.6, the server transmits the command with image data to the electronic rack label via an access point. *Nagata*, [0121], [0133]. As I explained above in 1.2.2 and 1.4, a POSITA would have recognized the electronic rack label remains in a longer awake transmission state that is matched by access point 320 while the server processing occurs. The access point receives and transmits the server-generated command shown in my annotated version of Figure 8, which I provide below:



Id., Fig. 8 (step S6), [0121] (“[I]n step S6, the server-control part 15 of the server 10 controls the server-communications part 11 so that the storage- and display-change command generated by the server-communications part 11 is transmitted to the electronic rack label 40 **via the corresponding access point 30.**”) (my emphasis added), Fig. 9 (S16) [0133] (“The processes in step S16 and step S17 are the same as the processes in the above-mentioned step S6 and step S7, and therefore explanations thereof are omitted.”).

124. Furthermore, Nagata's access point precedes every information transmission to the electronic rack label with a timed beacon that indicates either the "presence or absence of information transmission" following the beacon. *Id.*, [0033], [0083]. Regardless whether the electronic rack label sent a user-generated instruction to the server (an uplink and downlink transmission), or the server itself initiated a command for the electronic rack label (a downlink only transmission), a POSITA would have understood the access point would have transmitted a beacon preceding the server-generated command ("control instruction") including image data as I explained in claim limitation 1.6 before transmitting the command to ensure the electronic rack label remains in the longer, active transmission state ("fast monitoring mode") to ensure reception of the server command. Because the beacon is sent to maintain the label in the fast monitoring mode, a POSITA would have understood it to be a "fast wake-up instruction."

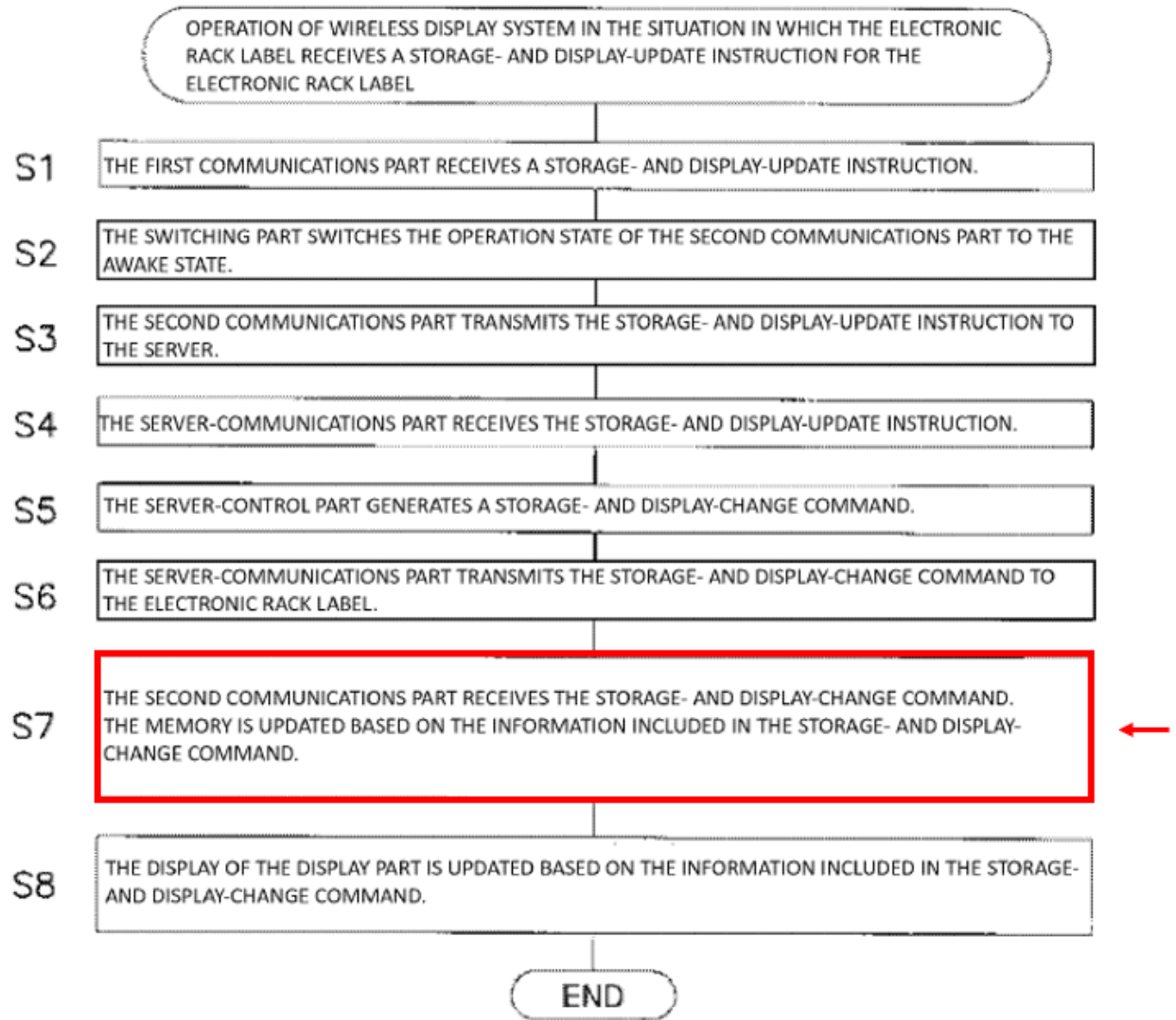
125. To the extent that PO argues that Nagata's beacon indicating forthcoming data is not the claimed "fast wake-up instruction," it is my opinion that Nagata still discloses or suggests this limitation. As I explained immediately above, Nagata's access point sends a timed beacon to a wakened label that indicates the presence or absence of information to follow. A POSITA would have understood that the label wakens to receive a beacon, but reverts back to a battery power-conserving sleep state (normal) mode when it the "absence"-indicating beacon. *Id.*,

[0033]–[0034]. Thus, to the extent PO argues that the “fast wake-up instruction” must revert the label to the normal low-power mode, it is my opinion that Nagata teaches it.

126. Accordingly, it is my opinion that a POSITA would have understood Nagata discloses or suggests the access point (“base station”) receives the server-generated command with image data (“control instruction and the second data”) and transmits a beacon (“fast wake-up instruction”) to the electronic rack label before the command to ensure the label remains in the awake operation state (“communicate with the electronic tag device in the fast wake-up mode”).

- k. Claim 1.8: “the electronic tag device is further configured to receive the fast wake-up instruction, the control instruction and the second data, and switch to the normal monitoring mode after completing the communication.”**

127. In my opinion, Nagata discloses and/or suggests this limitation. As I explained above, the electronic rack label receives the server-generated storage- and display-change command as highlighted in my annotated version of Figure 8, which I provide here:



Nagata, Fig. 8 (step S7), [0122], Fig. 9, [0133].

128. As I explained with respect to claim limitation 1.7, the electronic rack label first receives a beacon preceding the receipt of information—the server-generated storage- and display-change command—and remains in an awake operation state to receive that command before reverting back to a sleep state. Nagata further explains that the label only remains in the mode with the longer prescribed interval (“fast monitoring mode”) until it receives a command in step S7. *Id.*, Fig. 8

(S7), [0116], [0128]. Furthermore, when no data additional data is received by the label from the server, no other beacons would be sent by the access points. Accordingly, a POSITA would have further recognized Nagata's label would revert back to its normal state, which is a one second periodic awake state after the command is received, or after the awake time has elapsed. *Id.*, [0083].

129. Accordingly, it is my opinion that a POSITA would have understood Nagata discloses or suggests the electronic rack label ("electronic tag device") receives a beacon ("fast wake-up instruction") before receiving the server-generated command with image data ("control instruction and second data") and reverts back to a normal state ("normal monitoring mode") once the command has been implemented at the label ("after completing the communication").

2. Independent Claim 7

a. Claim 7.0: "An interactive electronic tag device communication method, comprising:"

130. In my opinion, Nagata discloses or suggests all of claim limitations 7.0–7.7.2 for substantially the same reasons as I explained with respect to claim limitations 1.0–1.8 in Section XI.A.1 because the claims are substantively identical, and Nagata further discloses steps of a method that "performs communication" using the same "wireless display system" described above. *Nagata*, Abstract.

131. Specifically, claim limitation 7.0 is substantially similar to claim limitation 1.0, except that it recites a "method" instead of a "system." As I explained

in Section XI.A.1, Nagata describes this method because it discloses “step[s]” to perform the claimed wireless communication of claim 7. *Id.*, [0115]–[0135].

132. The table below correlates the reasons I explained why Nagata discloses or suggests the limitations of claim 1 with claim limitations 7.1–7.7.

Claim 7.1	Claim 1.3
“transmitting, by an external device, first data to an electronic tag device through a second communication path in the electronic tag device;”	“the external device is configured to transmit first data to the electronic tag device through the second communication path;”
By my review, this claim limitation is substantially similar to 1.3. For the reasons I explained above, it is my opinion that Nagata discloses or renders obvious 7.1. See Section 108, above.	
Claim 7.2	Claim 1.4
“receiving, by the electronic tag device, the first data, transmitting the first data to a base station through a first communication path in the electronic tag device, and entering a fast monitoring mode;”	“the electronic tag device is configured to receive the first data, transmit the first data to the base station through the first communication path, and enter the fast monitoring mode;”
By my review, this claim limitation is substantially similar to 1.4. For the reasons I explained above, it is my opinion that Nagata discloses or renders obvious 7.2. See Section XI.A.1.g, above.	
Claim 7.3	Claim 1.5
“receiving, by the base station, the first data and transmitting the first data to a background server;”	“the base station is configured to receive the first data and transmit the first data to the background server;”
By my review, this claim limitation is substantially similar to 1.5. For the reasons I explained above, it is my opinion that Nagata discloses or renders obvious 7.3. See <i>supra</i> Section XI.A.1.h.	
Claim 7.4	Claim 1.6

“generating, by the background server, a control instruction and second data according to the first data, and transmitting the control instruction and the second data to the base station;”	“the background server is configured to generate a control instruction and second data according to the first data, and transmit the control instruction and the second data to the base station;”
By my review, this claim limitation is substantially similar to 1.6. For the reasons I explained above, it is my opinion that Nagata discloses or renders obvious 7.4. See Section XI.A.1.i, above.	
Claim 7.5	Claim 1.7
“receiving, by the base station, the control instruction and the second data, communicating with the electronic tag device in a fast wake-up mode, and transmitting a fast wake-up instruction, the control instruction and the second data to the electronic tag device through the first communication path; and”	“the base station is further configured to receive the control instruction and the second data, communicate with the electronic tag device in the fast wake-up mode, and transmit a fast wake-up instruction, the control instruction and the second data to the electronic tag device through the first communication path; and”
By my review, this claim limitation is substantially similar to 1.7. For the reasons I explained above, it is my opinion that Nagata discloses or renders obvious 7.5. See Section XI.A.1.j, above.	
Claim 7.6	Claim 1.8
“receiving, by the electronic tag device, the fast wake-up instruction, the control instruction and the second data, and switching to a normal monitoring mode after completing the communication;”	“the electronic tag device is further configured to receive the fast wake-up instruction, the control instruction and the second data, and switch to the normal monitoring mode after completing the communication.”
By my review, this claim limitation is substantially similar to 1.8. For the reasons I explained above, it is my opinion that Nagata discloses or renders obvious 7.6. See Section XI.A.1.k, above.	
Claim 7.7	Claim 1.2–1.2.2
“wherein the electronic tag device comprises two communication paths: the first communication path and the second communication path, the first	“wherein the electronic tag device comprises two communication paths: a first communication path and a second communication path; the first

communication path supports two monitoring modes: the normal monitoring mode and the fast monitoring mode, and the base station comprises two wake-up modes: a normal wake-up mode and the fast wake-up mode.”	communication path supports two monitoring modes: a normal monitoring mode and a fast monitoring mode; and the base station comprises two wake-up modes: a normal wake-up mode and a fast wake-up mode;”
By my review, this claim limitation is substantially similar to 1.2–1.2.2. For the reasons I explained above, it is my opinion that Nagata discloses or renders obvious 7.7. See Sections XI.A.1.c–XI.A.1.e, above.	

3. Independent Claim 14

- a. **Claim 14.0: “A non-transitory computer-readable storage medium storing therein a computer program for executing an interactive electronic tag device communication method comprising:”**

133. In my opinion, Nagata discloses or suggests claim 14 for substantially the same reasons as I explained with respect to claim 1. As discussed in Section XI.A.1, the claims are substantively identical, and Nagata further discloses both the electronic rack label and server control part (processing) components execute RAM- and ROM- stored programs with steps to “perform[] communication” in the same “wireless display system” described there. *Nagata*, Abstract, [0074]–[0076], [0094].

134. Claim limitation 14.0 is substantially similar to claim limitations 1.0 and 7.0, except that it recites a “non-transitory computer-readable storage medium storing therein a computer program for executing” instead of a “system” or “method.” Claim limitation 14.0 is disclosed for the reasons I provide below and those I already explained above. See Sections XI.A.1, XI.A.2.

135. The table below correlates the reasons I explained why Nagata discloses or suggests the limitations of claim 1 with claim limitations 14.1–14.7.

Claim 14.1	Claim 1.3
“transmitting, by an external device, first data to an electronic tag device through a second communication path in the electronic tag device;”	“the external device is configured to transmit first data to the electronic tag device through the second communication path;”
By my review, this claim limitation is substantially similar to 1.3. For the reasons I explained above, it is my opinion that Nagata discloses or renders obvious 14.1. See Section 108, above.	
Claim 14.2	Claim 1.4
“receiving, by the electronic tag device, the first data, transmitting the first data to a base station through a first communication path in the electronic tag device, and entering a fast monitoring mode;”	“the electronic tag device is configured to receive the first data, transmit the first data to the base station through the first communication path, and enter the fast monitoring mode;”
By my review, this claim limitation is substantially similar to 1.4. For the reasons I explained above, it is my opinion that Nagata discloses or renders obvious 14.2. See Section XI.A.1.g, above.	
Claim 14.3	Claim 1.5
“receiving, by the base station, the first data and transmitting the first data to a background server;”	“the base station is configured to receive the first data and transmit the first data to the background server;”
By my review, this claim limitation is substantially similar to 1.5. For the reasons I explained above, it is my opinion that Nagata discloses or renders obvious 14.3. See Section XI.A.1.h, above.	
Claim 14.4	Claim 1.6
“generating, by the background server, a control instruction and second data according to the first data, and transmitting the control instruction and the second data to the base station;”	“the background server is configured to generate a control instruction and second data according to the first data, and transmit the control instruction and the second data to the base

	station;”
By my review, this claim limitation is substantially similar to 1.6. For the reasons I explained above, it is my opinion that Nagata discloses or renders obvious 14.4. See Section XI.A.1.i, above.	
Claim 14.5	Claim 1.7
“receiving, by the base station, the control instruction and the second data, communicating with the electronic tag device in a fast wake-up mode, and transmitting a fast wake-up instruction, the control instruction and the second data to the electronic tag device through the first communication path; and”	“the base station is further configured to receive the control instruction and the second data, communicate with the electronic tag device in the fast wake-up mode, and transmit a fast wake-up instruction, the control instruction and the second data to the electronic tag device through the first communication path; and”
By my review, this claim limitation is substantially similar to 1.7. For the reasons I explained above, it is my opinion that Nagata discloses or renders obvious 14.5. See Section XI.A.1.j, above.	
Claim 14.6	Claim 1.8
“receiving, by the electronic tag device, the fast wake-up instruction, the control instruction and the second data, and switching to a normal monitoring mode after completing the communication;”	“the electronic tag device is further configured to receive the fast wake-up instruction, the control instruction and the second data, and switch to the normal monitoring mode after completing the communication.”
By my review, this claim limitation is substantially similar to 1.8. For the reasons I explained above, it is my opinion that Nagata discloses or renders obvious 14.6. See Section XI.A.1.k, above.	
Claim 14.7	Claim 1.2–1.2.2
“wherein the electronic tag device comprises two communication paths: the first communication path and the second communication path, the first communication path supports two monitoring modes: the normal monitoring mode and the fast monitoring mode, and the base station	“wherein the electronic tag device comprises two communication paths: a first communication path and a second communication path; the first communication path supports two monitoring modes: a normal monitoring mode and a fast monitoring mode; and the base station comprises

comprises two wake-up modes: a normal wake-up mode and the fast wake-up mode.”	two wake-up modes: a normal wake-up mode and a fast wake-up mode;”
By my review, this claim limitation is substantially similar to 1.2–1.2.2. For the reasons I explained above, it is my opinion that Nagata discloses or renders obvious 14.7. <i>See</i> Sections XI.A.1.c–XI.A.1.e, above.	

136. To the extent Patent Owner argues, or the Board finds, this claim requires the base station includes a non-transitory computer-readable storage medium storing therein a computer program for executing the method recited in claim 14, Nagata renders this claim element obvious.

137. A POSITA would have been motivated to include a program or software for execution in Nagata’s access point because the access point performs synchronized wireless communications with other devices implementing a memory storing programs or software for executing similar steps. Nagata discloses that the electronic rack label stores a “program” on “ROM,” “RAM,” “hard disk,” or “flash memory,” that each describes a non-transitory computer readable storage medium, for “executing” computer programs on the electronic rack label’s “CPU.” *Nagata*, [0074]–[0076]. The remote control 80 and/or smart phone 180 each store “software” on a “RAM,” or “ROM,” which describes a non-transitory computer readable storage medium, for executing on the remote control and/or smart phone’s “CPU.” *Id.*, [0037], [0045]. The server 10 stores a “program” on a memory, such as “ROM, RAM,” or “a hard disk,” which is a non-transitory computer readable storage

medium, for “executing” on the server-control part 15 of server 10 (a “computer”). *Id.*, [0030], [0094], [0102]. The “program” and “software” describe a computer program for executing the steps in claim 14 because the “program” and “software” are “executed” and used to implement the methods described by Nagata. *Id.*, [0045], [0075]–[0076], [0094], [0102], [0195]. Nagata teaches that the access point “is a communications apparatus that performs radio-wave-type wireless communication” between the server and electronic rack label via network 2, e.g., “a LAN (local-area network).” *Id.*, [0005], [0010], [0012], [0016], [0030]–[0031], [0033], [0083].

138. A POSITA would have been motivated to implement a memory (non-transitory computer-readable storage medium) storing the program or software for execution to perform the steps required for the access point to synchronize communication with the electronic rack label and packetize information for transmission via a LAN. Inclusion of a memory was known in the art to a POSITA, for example, as taught by Nagata. *Id.*, [0030], [0037], [0045], [0074]–[0076], [0094], [0102], [0195].

139. A POSITA would have been further motivated to implement a memory because it represents a known technique used to improve similar devices (e.g., other wireless communication devices) used to implement wireless communication, packet routing, and synchronization operations. *Id.*, [0030], [0037], [0045], [0074]–[0076], [0094], [0102], [0195]. A POSITA would have also found such techniques

obvious to try as a known way of implementing wireless communication, packet routing, and synchronization between an electronic rack label or other wireless device and a server. *Id.*, [0030], [0037], [0045], [0074]–[0076], [0094], [0102], [0195].

140. For example, U.S. Patent 7,567,791 to Laroia, et al. (“Laroia”) (Ex. 1013) discloses a base station 200 containing memory 210 further including routines 218 and data/information 220 to transmit and receive signals in both an “active” (red) and “standby” (blue) mode as disclosed in a state diagram with arrows showing state transitions, which I provide here:

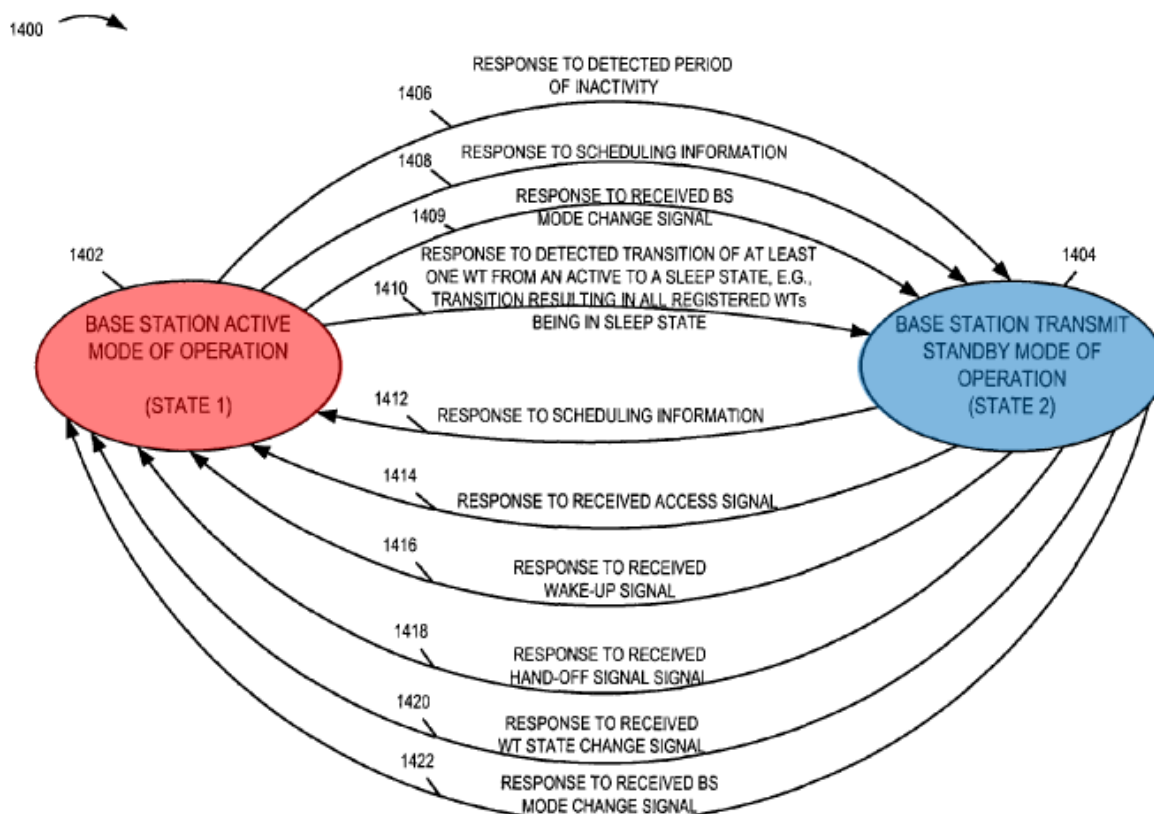


FIGURE 14

Laroia, 6:30–42, Fig. 14, 25:10–33. The “steps...[for] transitioning between” the two, “active” and “standby” base station modes of operation” are “implemented using machine executable instructions, such as software, included in a machine-readable medium such as a memory device, e.g., RAM, floppy disk, etc. to control a machine.” *Id.*, 31:10–34.

141. A POSITA would have reasonably expected success in including a non-transitory computer-readable storage medium to store instructions for execution in Nagata’s access point because each of Nagata’s other devices that communicate with the access point includes a memory storing software or programs for execution, as explained above. *Nagata*, [0030], [0037], [0045], [0074]–[0076], [0094], [0102], [0195].

142. Storing software or programs in a memory would have been a straightforward application of known, conventional wireless communication operations (storing software or programs for execution in hardware devices, such as access points) used according to their known functions to yield predictable results (allowing the hardware device to perform wireless communications, packet routing, and synchronization). *Id.*, [0030], [0037], [0045], [0074]–[0076], [0094], [0102], [0195].

4. Claims 2, 8, and 15: “wherein the electronic tag device is configured to attach an ID of the electronic tag device to the first data when transmitting the first data to the base station.”

143. By my review, claims 2, 8, and 15 depend from claims 1, 7, and 14, respectively, which as explained above, Nagata discloses or suggests. In my opinion, Nagata further discloses or suggests the additional limitation of claim 2.

144. Each label contains a memory that stores its respective apparatus ID. *Nagata*, [0075]. Nagata explains that when the label transmits the instruction received from the remote control or smart phone to the server, “[t]he apparatus ID...is affixed to the...instruction transmitted to the server 10” to identify that specific label. *Id.*, [0117], [0129]. Accordingly, Nagata discloses or suggests the additional limitation of claim 2.

145. Claims 8 and 15 are substantially similar to claim 2, except that they recite a “method” and a “non-transitory computer-readable storage medium storing therein a computer program for executing” instead of a “system.” For the reasons I explained above with respect to claim 2, Nagata discloses claims 8 and 15.

5. Claims 5, 11, 18: “wherein the electronic tag device is further configured to switch to the normal monitoring mode when the fast wake-up instruction transmitted by the base station is not received within a preset time range.”

146. By my review, claims 5, 11, and 18 depend from claims 1, 7, and 14 respectively, which as explained above, Nagata discloses or suggests. In my opinion, Nagata further discloses or suggests the additional limitation of claim 5.

147. As I explained above, access points 30 transmit beacons to the electronic rack labels that indicate the “presence or absence of information transmission” at a prescribed time interval corresponding to the mode of the label. *Nagata*, [0033]; see limitations 1.2.1 and 1.2.2. As I also explained in limitation 1.7, above, a POSITA would have recognized the beacon indicating the presence of following information discloses or suggests a fast wake-up instruction. *Nagata* explains that if “information is not to be transmitted to one of the . . . labels 40, the access point 30 transmits a beacon that reports to the electronic rack label 40 that information will not be transmitted.” *Nagata*, [0033]. However, if the label receives a beacon indicating subsequent data, the label extends its awake state for an additional amount of time (e.g., 30 seconds), thereby maintaining the faster mode (i.e., “fast monitoring mode”). *Id.*, [0083], [0116], [0128]. A POSITA would have thus understood that if the data is not to be received, e.g., a beacon indicating no data or the label awake state times out, the label will not extend its awake time and revert to the normal mode of one second on every one minute (“normal monitoring mode”) once the current prescribed-time interval elapses. *Id.*, [0033]–[0034] (explaining the label returns to a sleep state unless a “presence”-indicating beacon is received), [0083] (explaining that if the label does not receive a beacon indicating data, it is normally in a lower power mode, switching on for one second, once a minute),

[0116] (the label stays “in the awake state for a prescribed interval (e.g., 30 s)”), [0128] (same).

148. Alternatively, to the extent that the beacon indicating that no subsequent data will be transmitted is the “fast wake-up instruction,” as I explained above in claim limitation 1.7, POSITAs would have nevertheless understood that if no communication is received by the label, the label will not extend its awake time and will revert to the normal mode of one second on every one minute (“normal monitoring mode”) once the current prescribed-time interval elapses. *Id.*, [0033]–[0034], [0083], [0116], [0128]. This curtails the power consumption of the battery instead of keeping the label in the awake state if communication with the access point is lost. *Id.*, [0029], [0034] (describing battery power curtailment by switching into a low-power mode).

149. Claims 11 and 18 are substantially similar to claim 5, except that they recite a “method” and a “non-transitory computer-readable storage medium storing therein a computer program for executing” instead of a “system.” For the reasons I explained above with respect to claim 5, it is my opinion that Nagata also discloses claims 11 and 18.

6. Claims 6, 12, 19: “wherein the electronic tag device is further configured to switch to the normal monitoring mode when the fast wake-up instruction is received but the control instruction and the second data are not received within a preset time range.”

150. By my review, claims 6, 12, and 19 depend from claims 1, 7, and 14 respectively, which as I explained above, Nagata discloses or suggests. In my opinion, Nagata further discloses or suggests the additional limitation of claim 6.

151. As I explained above for claim 5, in normal mode an electronic rack label wakes up once every minute for one second to receive a beacon transmitted by the access point that indicates the presence or absence of following information. When a transmitted beacon indicates the presence of information (“fast wake-up instruction”), the electronic rack label maintains an awake operation (“fast monitoring mode”) for a prescribed interval (“present time range”) rather than immediately returning the label to its normal state (“normal monitoring mode”). *Nagata*, [0033]. That time interval may be thirty seconds. *Id.* [0083]. A POSITA would have understood the label would have switched back to its normal state once that thirty seconds elapses—even if no server command with image data is received—because this curtails the power consumption of the battery instead of keeping the electronic rack label in the awake state until the information from the server (“control instruction and second data”) is received. *Id.*, [0029], [0034]. Nagata expressly discloses the alternative of maintaining an awake state until it receives the server-generated command and switches to a stopped state. *Id.*, [0116], [0128].

152. Nagata expressly discloses the labels revert to sleep state after an elapsed period of time (e.g., 30 seconds), *unless* the labels switch into an awake state conditioned upon receipt of a server command. *Id.*, [0116], (disclosing that a label switches its communications part 42 into an awake state for 30 seconds, but may “instead” (alternatively) maintain that awake state “until the second communications part 42 receives a storage- and display-change command in step S7”), [0138] (disclosing same). A POSITA would have understood Nagata’s label reverts to a sleep state by default within a prescribed amount of time (e.g., 30 seconds), unless the switching part is *expressly* programmed to maintain the awake state longer upon condition of a receipt of the server command. By expressly teaching the alternative, Nagata teaches that labels revert to a sleep state, ending the fast monitoring mode when 30 seconds elapses (“within a present time range”) whether or not that label receives the server command (“control instruction and second data”) *unless* expressly programmed to do so. POSITAs would have also understood that without the remote or smart phone communicating with the label to send another instruction, the label would reenter its normal mode of awaking for one second every minute. *Id.*, [0083].

153. Alternatively, to the extent that the beacon indicating that no subsequent data will be transmitted is the “fast wake-up instruction,” as I explained above in claim limitation 1.7, a POSITA would have understood that the label would

not extend its awake time and revert to its normal mode of awaking for one second every minute because no further data is expected to be received. *Id.* This curtails the power consumption of the battery instead of keeping the label in the awake state if communication with the access point is lost. *See, e.g., id.*, [0029], [0034] (describing battery power curtailment by switching into a low-power mode).

154. Claims 12 and 19 are substantially similar to claim 6, except that they recite a “method” and a “non-transitory computer-readable storage medium storing therein a computer program for executing” instead of a “system.” For the same reasons I explained with respect to claim 6, it is my opinion that Nagata renders obvious claims 12 and 19.

7. Claim 13: “A computer device comprising a memory, a processor and a computer program stored on the memory and executable by the processor, wherein the processor implements, when executing the computer program, the method according to claim 7.”

155. By my review, this claim is substantially similar to claims 1, 7, and 14, except that claim 13 also recites “executable by [a] processor.” In my opinion, Nagata discloses or suggests three processor components used to execute the steps described in claim 7 for three reasons. First, each smart phone/remote control includes a CPU for executing memory-stored instructions. *Nagata*, [0037], [0045]. Second, the labels each contain a “control part 44” with a CPU for executing a program that a POSITA would have recognized as a processor. *Id.*, [0074]–[0076]. Third, Nagata’s server is a “common computer” with “control part 15” that a

POSITA would have recognized includes a processor for executing “[v]arious programs.” *Id.*, [0087], [0094], [0102]. These processing components in these devices execute stored instructions, i.e., programs, to carry out the claimed steps of claim 7 as discussed for claims 1, 7, and 14, above. See §§ XI.A.1, XI.A.2, XI.A.3.

A. Ground 2: Nagata in view of Hashiguchi renders Claims 1, 2, 5–8, 11–15, 18, 19 obvious

156. To the extent Patent Owner argues, or the Board finds, that Nagata does not disclose or render obvious 1.2.1, 1.2.2, 1.4, 1.7, 1.8, 7.2, 7.5, 7.6, 7.7, 14.2, 14.5, 14.6, and 14.7, it is my opinion that Hashiguchi renders these limitations obvious as I explain below.

1. Independent Claim 1

a. Claim 1.2.1 “the first communication path supports two monitoring modes: a normal monitoring mode and a fast monitoring mode”

157. Like Nagata, Hashiguchi discloses an electronic rack label 240 (“label”) (electronic tag device) communicating with an access point 30 (base station) via a communications part 42. Also, like Nagata, the label has a “sleep state” where “electric power is not supplied” to a “communications part 42” and it does not communicate with the access point 30, and an “awake state,” where “electric power is supplied” to “communications part 42” to communicate with the access point 30. *Hashiguchi*, [0037], [0045], [0123]–[0124]. Cycling between the sleep state and awake state is controlled by a control part 244 of the electronic rack label

240, which sets “ratios of the sleep state time and the awake state time” to operate different “control modes.” *Id.*, [0037], [0043], [0115], [0123]. These “ratios” of sleep-state time and awake-state time describe how frequently the electronic rack label wakes up to check for information. *Id.*, [0042], [0067], [0068], [0070]–[0071], [0101], [0107], [0138]–[0139].

158. Hashiguchi discloses two label operation modes defined by an access point communication rate with a label for a duration state. In “energy-saving mode,” the label awakens at “comparatively long intervals of time” and communicates at a “normal” rate for a short duration. *Id.*, [0127] (describing access point “normal command transmission mode” communicating at a rate of 20-second intervals), [0138] (label awakens every 20 seconds in energy-saving mode for a duration of time, Δt , which is 150 milliseconds). In “active mode” the communication duration remains the same, but the label wakens at “comparatively short intervals of time” and communicates at a “rapid interval.” *Id.*, [0070], [0128] (describing an access point “rapid command transmission mode” communicating at a rate of 4-second intervals), [0139] (label awakens every 4 seconds in the active mode for the same duration, Δt). A POSITA would have understood that Hashiguchi defines the term Δt as 150 milliseconds barring separate definition and because Hashiguchi discloses the ratio of Δt to T3 is smaller than Δt to T4 while only changing the denominator;

$150\text{ms} = 0.150 \text{ seconds} / 20 \text{ seconds} = .0375$. *Compare Hashiguchi*, [0137] *with id.*, [0138].

159. Hashiguchi's two modes are similar to Nagata's because they follow a scheduled and "repetitively" performed rate of waking up an electronic rack label to check for information from an access point. *Nagata*, [0029], [0033], [0083]. But whereas Nagata varies the *duration* characteristic of the label's modes and holds the duration state constant, Hashiguchi varies the *rate* characteristic of the label's modes (i.e., how often the label switches into awake mode) and holds the duration of that mode constant (i.e., how long awake mode lasts), as I explained above. *Compare Nagata*, [0083], *with Hashiguchi*, [0138]–[0139].

160. Advantageously, this enables Hashiguchi to increase the electronic rack label's communicative responsiveness while decreasing its battery power drain. Specifically, Hashiguchi's disclosed 20- and 4-second wake time intervals occur more frequently than Nagata's 1-minute (60-second) wake times, which enables Hashiguchi's label to "listen" for signals more often per period of time. *Compare Hashiguchi*, [0138]–[0139] *with Nagata*, [0083]. Specifically, Hashiguchi's label wakes up every 20 seconds or 4 seconds, which mathematically corresponds to waking 3 times a minute ($60 \text{ seconds} / 20 \text{ seconds} = 3 \text{ times}$) or 15 times a minute ($60 \text{ seconds} / 4 \text{ seconds} = 15 \text{ times}$). *Hashiguchi*, [0138]–[0139]. But Nagata's label wakes up to communicate only once a minute (1 time). Because this linearly

correlates to the availability of the label's RF communications to receive a transmission, a POSITA would have understood that Hashiguchi's label is therefore also available to receive instructions and commands 3 to 15 times a minute, and normalizing the comparison to a 60-second minute means Hashiguchi's label can communicate 3–15 times (3x – 15x) more often than Nagata's label.

161. A POSITA would have also understood that Nagata's label remains awake for longer durations of time (e.g., 30 seconds) once awakened, which requires more battery power to be supplied for a longer duration than Hashiguchi's shorter duration of time (e.g., 150 milliseconds (ms)). *Nagata*, [0083], *Hashiguchi*, [0138]–[0139]. Accordingly, a POSITA would have understood that Hashiguchi's label communication components are able to communicate more often using less battery power because they are wakened more frequently for less time than Nagata's. Specifically, a POSITA would have understood that at its most available rate (every 4 seconds, or 15 times a minute), Hashiguchi's label wakes for only 150 milliseconds each time, the product of which is a total of 15 times / minute * 150 milliseconds per time = 2,250 milliseconds per minute that Hashiguchi's label communications are powered "on." Conversely, Nagata's label communications are powered on far longer at the label's maximum availability lasting 30 seconds once a minute for a total of 1 time / minute * 30 seconds per time = 30,000ms per minute. Comparing the two most available communication states of Nagata and Hashiguchi, a POSITA

would have recognized Nagata drains the battery power much more quickly than Hashiguchi.

162. Thus, a POSITA would have been motivated to use Hashiguchi's awake time ratios so that the amount of time spent in the "awake state is less" and, therefore, "power consumption of the battery is less." *Hashiguchi*, [0008], [0020], [0138]–[0139]. In tandem, a POSITA would have been motivated to implement Hashiguchi's increasingly frequent awake times into Nagata's label switching processes at shorter durations to, e.g., rewrite the product information displayed by a label within a shorter time. *Id.*, [0009]–[0010], [0083]–[0084], [0147].

163. As I noted above, Hashiguchi and Nagata share inventors, Applicants, content, and explanation for their similar disclosures. Thus, a POSITA would have understood that Nagata and Hashiguchi were combinable. A POSITA would have also been motivated to combine Nagata and Hashiguchi because this implementation would have required nothing more than the application of known, conventional techniques (switching the label communications component into an awake state at timed intervals and durations using label CPU-executed processes) to yield predictable results (switching into the awake state more often for less time) as described in Nagata and Hashiguchi. *Id.*, [0127]–[0129], [0138]–[0139], [0147], [0157]; *Nagata*, [0033], [0083].

b. Claim 1.2.2: “and the base station comprises two wake-up modes: a normal wake-up mode and a fast wake-up mode”

164. In my opinion, the Nagata-Hashiguchi combination teaches claim 1.2.2. As I explained in 1.2.1, Hashiguchi teaches that the access point communicates with the label using a “normal command transmission mode” and a “rapid command transmission mode.” *Hashiguchi*, [0127]–[0129], [0138], [0143]. The access point’s transmission mode is “synchronized” with “the awake operation timing of the electronic rack label 240” such that the access point transmits “beacon signals” synchronized with the label’s awake time ratio. *Id.*, [0068], [0071], [0127], [0138]. The access point’s normal and rapid command transmission modes communicate with the label in the label’s 20-second and 4-second time interval cadences. *Id.*, [0127]–[0129], [0139].

165. Specifically, in the access point’s normal command transmission mode, the server may “instruct[] the access point 30” to “transmit a command, following one of the beacons” at “a 20 s interval.” *Id.*, [0127]. Conversely, in the access point’s rapid command transmission mode, the server may instruct the access point to transmit information following the beacons “at 4 s intervals,” thereby permitting the access point to increase the frequency (i.e., quicken the rate) for transmitting data to the label in the label’s active (i.e., awake) mode. *Id.*, [0127]–[0129], [0143]. The access point’s rapid command transmission mode thus “synchronize[s]” with the label’s active mode, making it “possible to shorten the average time it takes until the

completion of command [information] transmission” when the label needs to be “updated in a short time,” for example, following a user’s NFC interaction. *Id.*, [0128], [0129], [0138], [0143], [0147].

166. Further, the access point and label communicate using a shared, bidirectional communication channel; the access point transmits beacons and server commands to the label as appropriate, and the label transmits a response signal acknowledging receipt of a server command following that beacon. *Id.*, [0031], [0037]. Although Hashiguchi does not specifically describe the network standard for that bidirectional channel, a POSITA would have found it obvious to follow well-known standards of the time, such as the IEEE 802.15.4/ZigBeeTM network type channel, as I explained in Section XI.A.1.e, above.

167. Therefore, a POSITA would have recognized Hashiguchi’s access points transition between modes (“wake up”) at the same times and for the same durations as the labels (“normal” and “fast”) according to the label awake ratios (e.g., wake every 20 seconds for 150 milliseconds in the normal, energy-saving mode and every 4 seconds for 150 milliseconds in the rapid transmission mode) to successfully (i) communicate with the labels at (ii) a shared rate of communication supported by a common, standardized network before each label reverts to a non-communicative sleep state to conserve power. *Id.*, [0068], [0071], [0138]–[0139], [0142]–[0144].

168. A POSITA would have found it obvious to implement Hashiguchi's rapid command transmission mode in the access points in Nagata's system to "synchronize" the communications cycles between the label and the access point to provide a system where the label can be "updated in a short time" with "high responsiveness" using the higher awake time ratio while also "curtailing the electric power consumption." *Id.*, [0082]–[0084], [0087]–[0089], [0093], [0147], [0157]–[0158]. Moreover, a POSITA would have recognized implementing Hashiguchi's rapid command transmission mode in the access points of Nagata's system would allow them to be "synchronized" with or be "timed to" the label's "awake state[s]" in the "active mode" to synchronize the access point's information transmission with the label's monitoring timing when the label expects information. *Id.*, [0068], [0071], [0138], [0143]; *Nagata*, [0033].

169. A POSITA would have been motivated to combine Nagata and Hashiguchi to improve the label's communication responsiveness and curtail its battery power consumption, as I explained immediately above. *Hashiguchi*, [0068], [0071], [0127]–[0129], [0138]–[0139], [0143], [0157]–[0158]; *Nagata*, [0033], [0083]. A POSITA would have been further motivated by Hashiguchi's teaching that, in the rapid command transmission mode, the access point can transmit information more frequently (e.g., at 4 second intervals or less) to "synchronize"

with the active mode of the label to be “updated in a short time.” *Hashiguchi*, [0128]–[0129], [0138], [0143], [0147].

170. This implementation represents a known technique used to improve similar devices (e.g., systems for updating electronic tag devices) by prescribing faster communication cycles to both improve responsiveness and reduce power consumption in the same way as described in the prior art and explained above. § XI.A.1.a; *Hashiguchi*, [0068], [0071], [0138]–[0139], [0146]–[0147], [0157]–[0158]; *Nagata*, [0002], [0004], [0006], [0034], [0086], [0114], [0124], [0135], [0166]. A POSITA would have known that Laroia, for example, describes managing the transmissions from multiple, adjacent base stations according to timing and conditional demand criteria to conserve transmission power by preventing unnecessary (i.e., wasted) transmissions. *Laroia*, Abstract, 1:35–57, 3:37–45.

171. Moreover, such implementation would have been obvious to try as a known way of improving battery management while also improving responsiveness of an electronic tag device, which the state of the art sought to improve. *Hashiguchi*, [0006]–[0007], [0009], [0011], [0017], [0021], [0069], [0071], [0138]–[0139], [0146]–[0147], [0157]–[0158]; *Nagata*, [0004], [0006], [0029], [0034], [0114], [0124], [0135], [0166]. A POSITA would have known that Laroia, for example, describes reducing signal interference, and thereby increasing “overall system throughput” by operating base stations in sleep states when unneeded for

transmission. *Laroia*, 1:35–57, 3:37–45. Additionally, a POSITA would have known that U.S. Patent Application Publication 2017/0011238 to Andreas Rößl, et al. (“Rößl”) (Ex. 1014) describes a communication station (i.e., base station) that forcibly wakes up a single radio tag to communicate outside its known time slot according to a known priority, then allow that tag to re-synchronize itself with its prescribed communication time slot for better communication that mitigates the need to wake all radio tags for simultaneous communicate. *Rößl*, [0005], [0037].

172. A POSITA would have reasonably expected success in implementing Hashiguchi’s rapid command transmission mode into Nagata’s access points because the combination represents nothing more than the combination of known elements used according to their ordinary and expected operations. This combination was well within the skill of a POSITA and would have required nothing more than the application of known, conventional techniques.

173. A POSITA would have reasonably expected to succeed because Nagata teaches synchronizing the access point’s transmissions “timed to” match the label’s awake state in the normal mode, as explained in Ground 1. *Nagata*, [0033]. Nagata also teaches a faster data transmission, which a POSITA would have recognized be implemented using Hashiguchi’s rapid command transmission mode to account for the shorter information transmission intervals. This implementation would have only needed to apply Hashiguchi’s shorter transmission time intervals to Nagata’s access

points, as explained in Hashiguchi, to achieve success. *Hashiguchi*, [0068, [0071], [0127]–[0129], [0138], [0139], [0143]; *Nagata*, [0033], [0083].

174. Implementing the shorter periodic intervals at the access point synchronized with the label’s active mode (e.g., one, two, or a few seconds) would have been a straightforward application of known, conventional components executing common communication sequence and timing operations used according to their known functions to yield predictable responsiveness and power-saving results as explained in claim limitation 1.2.1 and the paragraphs above.

c. Claim 1.4: “the electronic tag device is configured to receive the first data, transmit the first data to the base station through the first communication path, and enter the fast monitoring mode”

175. To the extent Patent Owner argues, or the Board finds, Nagata does not disclose or render obvious a “fast monitoring mode,” it is my opinion that the Nagata-Hashiguchi combination renders it obvious for the reasons I explained above. See Section XI.A.1.a. The remainder of claim limitation 1.4 is taught in Nagata as I explained in Section XI.A.1.g, and a POSITA would have been motivated to combine Nagata and Hashiguchi for the reasons I explained in Sections XI.A.1.a, XI.A.1.b.

- d. **Claim 1.7: “the base station is further configured to receive the control instruction and the second data, communicate with the electronic tag device in the fast wake-up mode, and transmit a fast wake-up instruction, the control instruction and the second data to the electronic tag device through the first communication path; and”**

176. To the extent Patent Owner argues, or the Board finds, Nagata does not disclose or render obvious the “fast wake-up mode” or “fast wake-up instruction” of claim limitation 1.7, it is my opinion that the Nagata-Hashiguchi combination renders them obvious. The remainder of claim limitation 1.7 is also taught in Nagata as I explained in Section **Error! Reference source not found.**

177. A POSITA would have found it obvious to implement the fast wake-up mode of Hashiguchi, as I explained in claim limitation 1.2.2. *See* Section 160, above. Furthermore, A POSITA also would have found it obvious to implement a beacon transmission, such as including an indicator to indicate whether information is to be transferred, (fast wake-up instruction) as part of the access point’s fast wake-up mode (either as disclosed or rendered obvious by Nagata or taught by Hashiguchi) to facilitate communications with the electronic rack label in its active mode.

178. Hashiguchi explains that this is done by a beacon signal “for informing the electronic rack labels 40 of the presence/absence of a command transmission” during an expressly termed “rapid command transmission mode” (fast wake-up mode) providing an instruction for the label whether it should remain awake to receive the requested information, similar to Nagata. *Hashiguchi*, [0031], [0128].

Specifically, Hashiguchi explains, in the rapid command transmission mode (fast wake-up mode), access point 30 transmits “beacons” “at 4 s[econd] intervals” *synchronized* with the label’s active mode to facilitate communications when there is a “high probability” of information being transmitted to the label. *Id.*, [0068], [0071], [0128]–[0129], [0147].

179. A POSITA would have been motivated to implement Hashiguchi’s rapid command transmission mode beacon signal instructions (“fast wake-up instruction”) as part of the fast wake-up mode implemented in Nagata’s access point because a POSITA would have recognized that Nagata and Hashiguchi disclose a similar system and beacon transmission techniques. Therefore, transmitting Hashiguchi’s beacon instructions in Nagata with Hashiguchi’s expressly “rapid” 4-second intervals would have improved response time of the label while also advancing Nagata’s and Hashiguchi’s goals to extend battery life of the label by reducing time spent in the awake state. *Nagata*, [0033], [0083]; *Hashiguchi*, [0068], [0071], [0127]–[0129], [0138].

180. A POSITA would have been motivated to further transmit Hashiguchi’s beacon signal instructions during the rapid command transmission mode that is synchronized to the label’s active mode cycle to indicate the “presence or absence” of information for the active-mode label to prevent it from “immediately returning to the sleep state” when there is data to be sent during the period where “there is a

high probability that product information will be transmitted” after an NFC trigger. *Nagata*, [0033]; *Hashiguchi*, [0147]. A POSITA would have been motivated to implement this functionality to indicate to a label whether the expected information is ready for transmission and the label should either stay awake or may return to the sleep state. A POSITA would have recognized this to achieve Nagata’s and Hashiguchi’s goals of reducing time spent in the awake state when there is no information to receive. *Nagata*, [0029], [0033], [0034], [0083]; *Hashiguchi*, [0031], [0068], [0071], [0127]–[0129], [0138], [0147], [0157].

181. Further motivation is provided because implementing Hashiguchi’s beacon signal instructions in the rapid command transmission mode represents a known technique used to improve similar devices (e.g., other electronic tag devices) in the same way to reduce overall power consumption and improve battery life and energy maintenance at the electronic tag device. *Hashiguchi*, Abstract, [0031], [0068], [0071], [0127]–[0129], [0143]; *Nagata*, [0033], [0083]. Such techniques would have been obvious to try as known ways of improving battery management and energy consumption for electronic tag devices and because the state of the art sought to use these improved techniques. *Hashiguchi*, Abstract, [0031], [0068], [0071], [0127]–[0129], [0143]; *Nagata*, [0033], [0083].

182. A POSITA would have reasonably expected success in implementing Hashiguchi’s beacon signal instructions in the rapid command transmission mode in

Nagata’s access point during the non-normal operation in response to an NFC trigger because the combination represents nothing more than the combination of known elements used according to their ordinary and expected operations, as I explained above. See Section XI.A.1.b. This combination was well within the skill of a POSITA and would have required nothing more than the application of known, conventional techniques (the access point transmitting the beacon signal instruction to the label) to yield predictable results (informing a label of the presence or absence of information to either remain awake or return to the sleep state). *Nagata*, [0033], [0083]; *Hashiguchi*, [0031], [0068], [0071], [0127]–[0129], [0143].

183. Transmitting a beacon signal instruction from the access point to the label also would have been a straightforward application of known, conventional electronic label operations (transmitting a beacon signal from an access point to an electronic rack label) used according to their known functions to yield predictable results (informing the label of the presence or absence of data to be received from the access point). *Nagata*, [0033], [0083]; *Hashiguchi*, [0031], [0068], [0071], [0127]–[0129], [0143].

- e. **Claim 1.8: “the electronic tag device is further configured to receive the fast wake-up instruction, the control instruction and the second data, and switch to the normal monitoring mode after completing the communication.”**

184. To the extent Patent Owner argues, or the Board finds, Nagata does not disclose or suggest receiving the fast wake-up instruction, it is my opinion that the

Nagata-Hashiguchi combination renders it obvious for the reasons I explained above. See Sections XI.A.1.a, XI.A.1.b; *Hashiguchi*, [0031], [0128]–[0129], [0143]; *Nagata*, [0029], [0033], [0083]. The remainder of claim limitation 1.8 is taught in Nagata as I explained in Section XI.A.1.k.

2. Independent Claims 7 and 14

185. The Nagata-Hashiguchi combination renders obvious several claim limitations that I explain below, but for those claims 7 and 14 limitations I do not address below, they are disclosed or rendered obvious by Nagata as I explained in Ground 1, Sections XI.A.2 and XI.A.3, above.

- a. Claims 7.2, 14.2: “receiving, by the electronic tag device, the first data, transmitting the first data to a base station through a first communication path in the electronic tag device, and entering a fast monitoring mode”**

186. By my review, these limitations are substantially similar to claim limitation 1.4. For the same reasons I explained above, the combination of Nagata and Hashiguchi renders obvious claim limitations 7.2 and 14.2. See Section XI.A.1.g, above.

- b. Claims 7.5, 14.5: “receiving, by the base station, the control instruction and the second data, communicating with the electronic tag device in a fast wake-up mode, and transmitting a fast wake-up instruction, the control instruction and the second data to the electronic tag device through the first communication path; and”**

187. By my review, these limitations are substantially similar to claim limitation 1.7. For the same reasons I explained above, the combination of Nagata

and Hashiguchi renders obvious claim limitations 7.5 and 14.5. *See* Section XI.A.1.j, above.

- c. **Claims 7.6, 14.6: “receiving, by the electronic tag device, the fast wake-up instruction, the control instruction and the second data, and switching to a normal monitoring mode after completing the communication”**

188. By my review, these limitations are substantially similar to claim limitation 1.8. For the same reasons I explained above, the combination of Nagata and Hashiguchi renders obvious claim limitations 7.6 and 14.6. *See* Section XI.A.1.k, above.

- d. **Claims 7.7, 14.7: “wherein the electronic tag device comprises two communication paths: the first communication path and the second communication path, the first communication path supports two monitoring modes: the normal monitoring mode and the fast monitoring mode, and the base station comprises two wake-up modes: a normal wake-up mode and the fast wake-up mode.”**

189. By my review, this claim limitation is substantially similar to claim limitations 1.2.1 and 1.2.2. For the same reasons I explained above, the combination of Nagata and Hashiguchi renders obvious claim limitations 7.7 and 14.7. *See* Sections XI.A.1.d–XI.A.1.e, above.

- 3. **Claims 2, 8, 15: “wherein the electronic tag device is configured to attach an ID of the electronic tag device to the first data when transmitting the first data to the base station.”**

190. In my opinion, Nagata renders obvious the additional limitation of claim 2, as explained above for Ground 1. *See* Section XI.A.4. To the extent Patent

Owner argues, or the Board finds, that Nagata does not disclose or render obvious claim 2, then it is my opinion that the Nagata-Hashiguchi combination renders claim 2's additional limitation obvious.

191. Hashiguchi discloses or suggests a “linking operation” that associates each electronic rack label apparatus ID with particular product information to be associated with that ID before transmitting that package of information to the server. *Hashiguchi*, [0032], [0133], [0135]. Hashiguchi does not expressly disclose that the *electronic rack label* “transmit[s] the first data to the base station through the first communication path.” Instead, the *handy terminal* transmits the package of affiliated product information and electronic rack label identification information (“first data”) to the server.

192. By my review, claims 8 and 15 are substantially similar to claim 2, except that they recite a “method” and a “non-transitory computer-readable storage medium storing therein a computer program for executing” instead of a “system.” For the reasons I explained both here and in Ground 1 regarding claim 2, it is my opinion that Nagata and the Nagata-Hashiguchi combination both render obvious claims 2, 8, and 15.

4. Claims 5, 11, 18: “wherein the electronic tag device is further configured to switch to the normal monitoring mode when the fast wake-up instruction transmitted by the base station is not received within a preset time range.”

193. By my review, claims 5, 11, and 18 depend from claims 1, 7, and 14 respectively. For the same reasons I explained above, Nagata renders obvious the additional limitation of claim 5, as I explained in Ground 1. *See* Section XI.A.5, above.

194. To the extent Patent Owner argues, or the Board finds, that Nagata does not disclose or render obvious claim 5, then the Nagata-Hashiguchi renders them obvious. Hashiguchi discloses that the label may time out from the active mode because the active mode may be maintained for a “prescribed time (e.g. 1 min)” after the NFC trigger is received. *Hashiguchi*, [0079], [0085], [0143], [0145], Fig. 13 (step S203, S204). After “the prescribed time has elapsed,” the label switches “from the active mode [fast monitoring mode] to the energy-saving mode [normal monitoring mode].” *Id.*, [0143]–[0144].

195. To the extent Nagata does not disclose or render obvious transmitting a beacon signal in the fast wake-up mode, Hashiguchi expressly discloses transmitting a beacon signal during the access point’s “rapid command transmission mode” (fast wake-up mode). *Id.*, [0128]. A POSITA would have recognized that the access point may delay sending a beacon signal instruction beyond the specified beacon interval, for example, due to traffic. For example, Hashiguchi teaches that the label may not

receive the “distribution data addressed to itself” and then the active mode may lapse. *Id.*, [0143], [0144], Fig. 13 (step S203, S204). In situations where the access point delays transmitting the beacon signal instruction, the label would not receive the beacon signal instruction before elapsed time expires. *Id.*, [0143]–[0144]. The label would then timeout and return to the energy-saving mode. *Id.*, [0127]–[0129], [0138]–[0139], [0143]–[0144].

196. A POSITA would have been motivated to implement Hashiguchi’s timeout mechanism when the beacon signal instruction is not received within the prescribed period of time to prevent the label from being in the active mode for an extended period of time, thereby defaulting back to the energy-saving mode to preserve battery life.

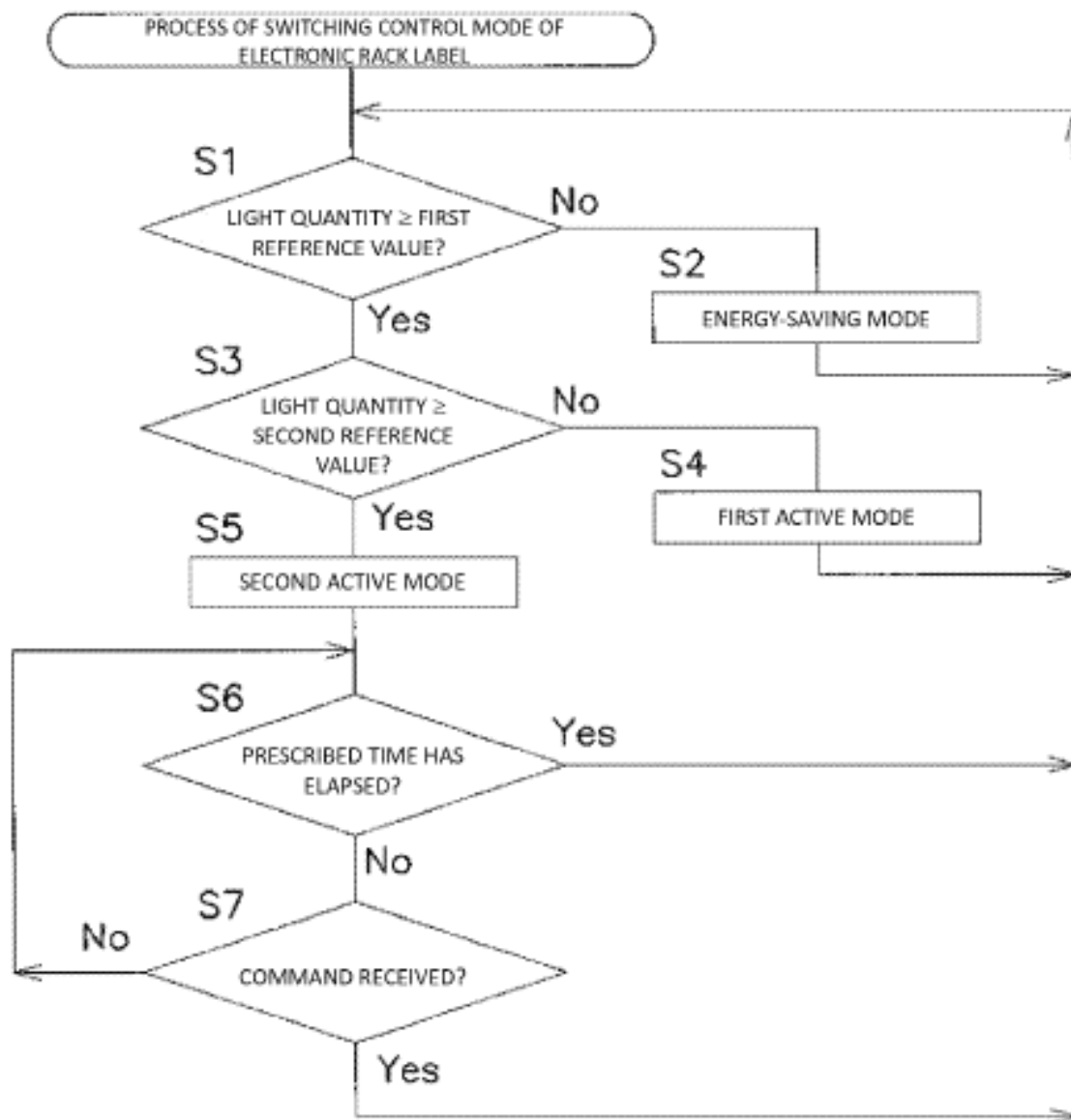
197. Claims 11 and 18 are substantially similar to claim 5, except that they recite a “method” and “non-transitory computer-readable storage medium storing therein a computer program for executing” instead of a “system.” For the reasons I explained both here and above in Ground 1 regarding claim 5, Nagata and the combination of Nagata and Hashiguchi renders obvious claims 5, 11 and 18.

5. Claims 6, 12, 19: “wherein the electronic tag device is further configured to switch to the normal monitoring mode when the fast wake-up instruction is received but the control instruction and the second data are not received within a preset time range.”

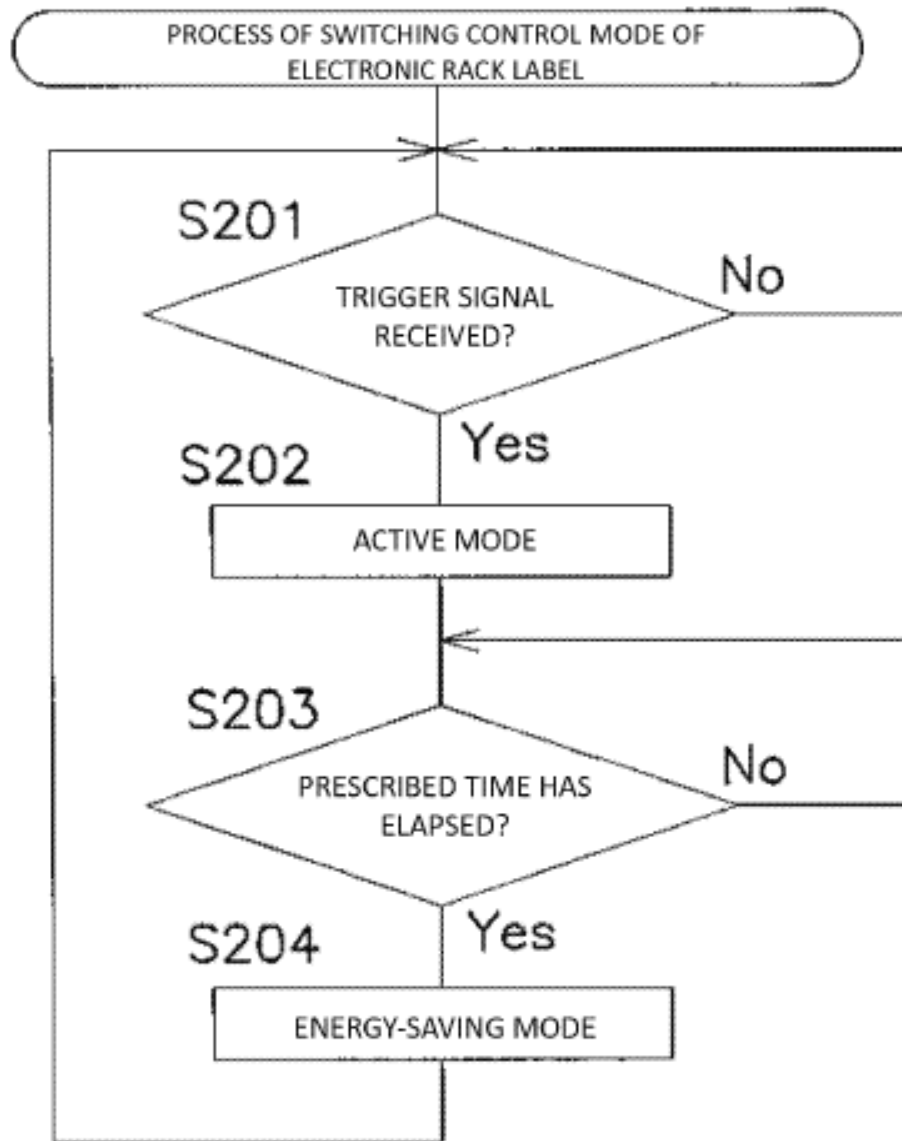
198. By my review, claims 6, 12, and 19 depend from claims 1, 7, and 14 respectively. For the same reasons I explained above, Nagata renders obvious the

additional limitation of claim 6, as I explained in Ground 1. *See* Section XI.A.6, above.

199. To the extent Patent Owner argues or the Board finds that Nagata does not disclose or render obvious claim 6, then the Nagata-Hashiguchi combination renders these claims obvious. As described above, Hashiguchi discloses a timeout for the active mode (fast monitoring mode) at the label. *See* Section XI.A.4, above; *Hashiguchi*, [0079], [0085], [0143], [0145]. These processes are illustrated in Figures 6 and 13, which I provide here:



Id., Fig. 6.



Id., Fig. 13.

200. Hashiguchi discloses a beacon for “informing” the electronic rack label of the “absence of a command transmission.” *Id.*, [0031]. In such situations where the access point transmits beacon (fast wake-up instruction) reporting that information will not be transmitted to the electronic rack label, the active mode (fast monitoring mode) of the electronic rack label 40 would timeout after the exemplary

one minute interval and return to the active mode (normal monitoring mode) after receiving the beacon (fast wake-up instruction), but not receiving the command (control instruction) or product information (second data). *Id.*, [0127]–[0129], [0138]–[0139], [0143]–[0144].

201. By my review, claims 12 and 19 are substantially similar to claim 6, except that they recite a “method” and “non-transitory computer-readable storage medium storing therein a computer program for executing” instead of a “system.” For the reasons I explained both here and above in Ground 1 regarding claim 6, Nagata and the combination of Nagata and Hashiguchi renders obvious claims 6, 12, and 19.

6. Claim 13: “A computer device comprising a memory, a processor and a computer program stored on the memory and executable by the processor, wherein the processor implements, when executing the computer program, the method according to claim 7.”

202. By my review, this limitation is substantially similar to claim 14. For the reasons I explained above for claims 1 and 14, Nagata discloses these additional limitations. *See* Sections XI.A.1 and XI.A.3, above.

203. To the extent Patent Owner argues, or the Board finds, that Nagata does not disclose or render obvious the additional limitation of claim 13, then the Nagata-Hashiguchi combination renders claim 13’s additional limitation obvious. Hashiguchi discloses CPU and processing components operating in an electronic rack label and server to execute instructions for operating the method steps described

in claims 1, 7, and 14 in Ground 1, above. *Hashiguchi*, [0039], [0120], [0126]–[0129]. Although Hashiguchi does not expressly describe a processing element in the handy terminal, a POSITA would have recognized it contains a processor because Hashiguchi discloses the handy terminal executes well-known types of decisions to transmit, receive, and process data with the remainder of Hashiguchi’s system in a “linking operation” used to pull electronic rack label and product data, associate it, and transmit it to the server. *Id.*, [0032], [0133], [0135].

B. Grounds 3A and 3B: Nagata in view of Thubert or Nagata in view of Hashiguchi and Thubert renders Claims 3, 4, 9, 10, 16, 17 Obvious

1. Claims 3, 9, 16

- a. Claim 3.0: “The interactive electronic tag device communication system according to claim 1, wherein when the first data is received by a plurality of base stations, the plurality of base stations are configured to attach respective energy value information of the plurality of base stations to the first data when transmitting the first data to the background server;”**

204. Nagata discloses or suggests the interactive electronic tag device communication system of claim 1 includes a plurality of base stations as I described in claim limitations 1.0–1.1, 1.3, above. Nagata in combination with Hashiguchi also renders obvious each and every element of claim 1 as explained with respect to Ground 2 above. In my opinion, Nagata further explains that a label may communicate with any of the access points. *Nagata*, [0032]. Accordingly, Nagata discloses or suggests more than one access point receiving a communication from a label because the label can communicate with all of the access points. Nagata in

combination with Hashiguchi also renders obvious each and every element of claim 1 as I explained with respect to Ground 2 above.

205. To the extent Nagata (or Nagata-Hashiguchi) does not expressly disclose or suggest attaching respective energy value information of the plurality of base stations to the first data when transmitting it to the background server, Thubert does. Thubert renders obvious selecting an optimal base station for this transmission. Accordingly, Nagata in view of Thubert, or the combination of Nagata and Hashiguchi in further view of Thubert, renders obvious the additional limitations of claim 3.

206. For example, Thubert teaches receiving first data at a plurality of base stations (APs), the plurality of base stations attaching respective energy value information of the plurality of base stations (signal strength, signal to noise ratio, signal quality) to the first data when transmitting the first data to a “supervisory device” (server). *Thubert*, [0054]–[0055]. The server (e.g., supervisory device) determines an optimal base station from the plurality of base stations (e.g., creating a VAP of one or more APs, or selecting primary AP in the VAP) according to the respective energy value information (signal strength, signal to noise ratio, signal quality). *Id.*, [0057].

207. Considering Thubert’s teachings, a POSITA would have found it obvious to select an optimal base station from among a plurality of base stations in

Nagata's system based on the energy values of the base stations to transmit instructions and data to improve the reliability and throughput of the system, thereby ensuring better and more reliable communications for updating the electronic tag device.

208. A POSITA would have found this obvious because, generally, information throughput can be considered proportional to signal strength. For example, the article, "SINR, RSRP, RSSI and RSRQ Measurements in Long Term Evolution Networks" by Farhana Afroz, et al. ("Afroz") (Ex. 1015) publishes a case study exploring the relationship between network signal measurements (e.g., received signal strength indicators ("RSSI") and reference signal received power ("RSRP")) and network throughput (i.e., the number of information bits per modulation symbol that can be sent). *Afroz*, 113–15. This study found that the lesser the difference between the RSSI and RSRP, the more network throughput (i.e., faster and better network communication) is achieved because less interference exists. *Id.*, 117, 122. Therefore, a POSITA would have found it obvious to assign Nagata's electronic rack labels to base stations on the basis of the energy-based (i.e., power and signal strength) signal characteristics to minimize interference between hundreds or thousands of labels communicating in a store for better overall network throughput. For example, *Afroz* describes how higher values of network signal-to-noise ratios of transmissions (i.e., more desired data signal and less noise

interference is transmitted) permits higher network throughput. *Id.*, 119. Laroia also explains that base stations with multiple modes that facilitate reduced power transmission “in terms of frequency and/or power level” reduces interference between base stations, which allows “improved throughput”). *Laroia*, 2:33–50.

209. To further improve communications, Thubert teaches that the APs receive and report “at least one metric of the quality of the communication with the node (e.g., signal strength, signal to noise ratio, signal quality, etc.)” so that the best transmission can be selected as VAPs. *Thubert*, [0054]–[0055], [0057]. Implementing Thubert’s reporting of signal strength and selecting access points, as recited in claim 3 would have been obvious to a POSITA as a way to also reduce battery consumption of Nagata’s electronic rack labels. Improved transmissions resulting from Thubert’s system would reduce the amount of time the electronic rack label needs to be in the fast monitoring mode. Moreover, the sooner the transmission is successfully completed, the sooner the electronic rack label can return to the normal operating mode. More efficient return to normal operating mode results in the labels consuming less battery.

210. A POSITA would have been motivated to implement Thubert’s access point selection techniques in Nagata’s system (or in the Nagata-Hashiguchi system) to improve communications for sending the information to the electronic rack label, in particular by improving transmission quality that could further reduce battery

consumption by reducing the time that the electronic rack label spends in the fast monitoring mode.

211. It was well known to POSITAs that base stations (e.g., access points, often abbreviated “APs”) could determine signal strength of information received from an electronic tag device (e.g., node) that were used by a server to select the optimal base station for subsequent communications. *Id.* A POSITA would have been motivated to apply this well-known technique to Nagata’s electronic rack label system (either alone or in combination with Hashiguchi) to improve network throughput by optimizing signal quality. Specifically, higher quality signals reduce the total amount of time the label must operate in the fast monitoring mode because more information is transmitted with fewer signals and higher network throughput. This “ensure[s] high responsiveness” to “speedily change the display” of the electronic rack label while also limiting and “curtail[ing]” battery power consumption and network interference. *Hashiguchi*, [0008], [0138]–[0139], [0147], [0158]; *Nagata*, [0029], [0033]–[0034], [0083], [0114]; *Wolfe*, ¶211 (citing *Rößl*, [0009]). For example, RÖßl describes a radio tag “high power consumption... active state” used for “transmitting or receiving data, updating displays, measuring battery voltages, etc.,” making it critical to operate radio tags “in the sleep state as long as possible, and only... in the active state for the shortest possible time span when

absolutely necessary for data transmission with the communication station” for optimal energy efficiency. *Röβl*, [0009].

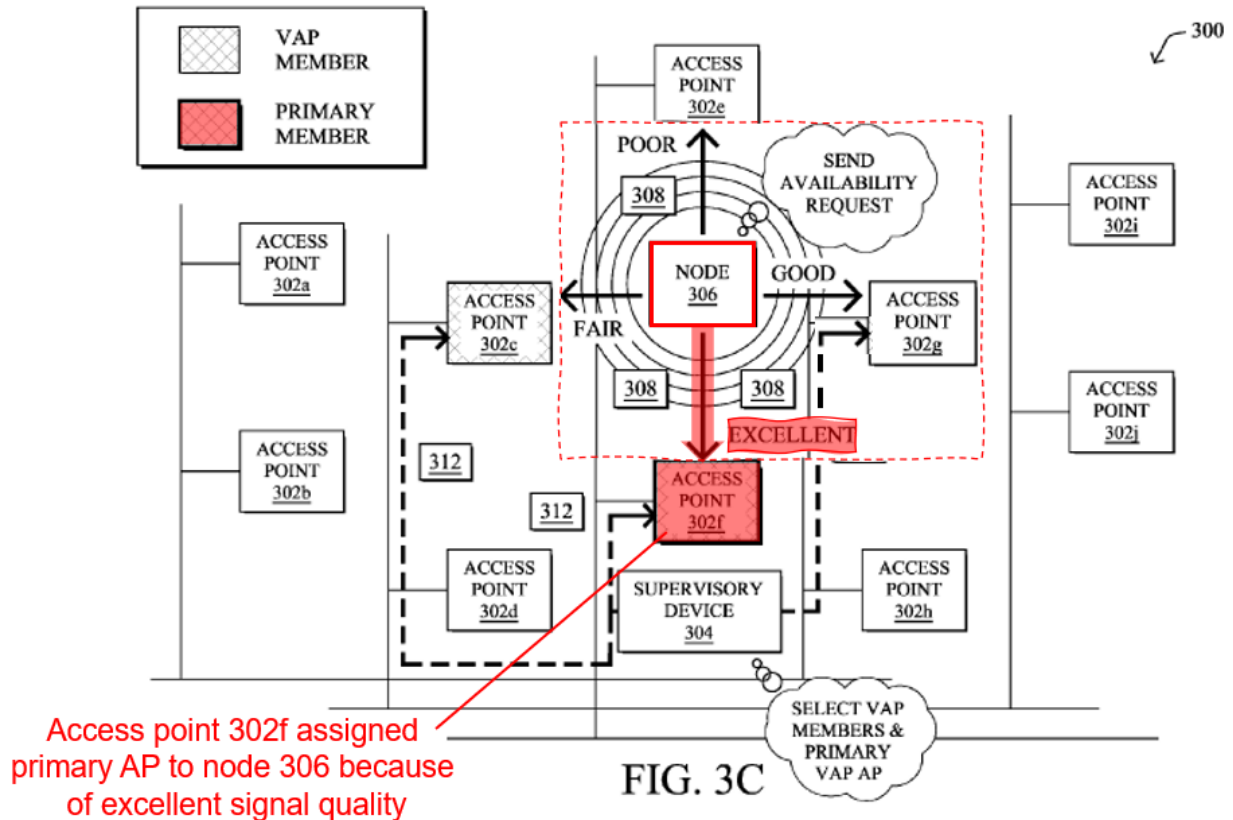
212. A POSITA would have also had a reasonable expectation of success in implementing the signal strength reporting and access point selection, as recited in claim 3 and taught by Thubert, in Nagata’s system (either alone or in combination with Hashiguchi) because it would have involved using only known techniques (known signal strength reporting and forming a VAP or selecting a primary AP) to improve similar devices (node-AP-server communications networks) in the same way as known in the prior art (selecting optimal AP to improve overall communications reliability).

213. Reporting signal strength characteristics and using them to select an optimal base station for information transmission would have been a straightforward application of known, conventional information transmission network operations (monitoring signal strength and selecting the device with the best signal strength) used according to their known functions to yield predictable results (sending information to the node (e.g., rack label) through the selected optimal access point).

2. **Claim 3.1: “the background server is configured to determine an optimal base station among the plurality of base stations according to the respective energy value information of the plurality of base stations, and transmit the control instruction and the second data to the electronic tag device through the optimal base station.”**

214. To the extent that Nagata (or Nagata-Hashiguchi) does not expressly teach that the background server is configured to determine an optimal base station among the plurality of base stations according to the respective energy value information of the plurality of base stations, and transmit . . . through the optimal base station, it is my opinion that Thubert does.

215. Thubert’s supervisory device assesses multiple access point transmission quality characteristics shared with a node as described in limitation 3.0, above. Thubert’s supervisory device (server) selects and maps—i.e., assigns—the best access points to a node as a function of the shared signal quality and dedicates the best as the “primary” AP. *Thubert*, [0056]–[0057]. For example, a POSITA would have recognized that the supervisory device may select access points 302c, 302f, and 302g to service node 306 on the basis of the “fair,” “excellent,” and “good” signal qualities between the node and those APs (with AP 302f as primary). This is shown in my superimposed, annotated combination of Figures 3A, 3C which I provide below:



Id., Figs. 3A, 3C.

216. Accordingly, it is my opinion that the Nagata-Thubert combination and Nagata-Hashiguchi-Thubert combination teach a supervisory device (“background server”) that receives and considers the signal quality characteristics between a node and several available access points (“respective energy value information of the plurality of base stations”) to select a best, primary access point (“optimal base station”) to map to a node.

- 3. Claims 9, 16: “wherein receiving, by the base station, the first data and transmitting the first data to a background server comprises: attaching, by a plurality of base stations, respective energy value information of the plurality of base stations to the first data when receiving the first data, and transmitting, by the plurality of base stations, the first data and the respective energy value information of the plurality of base stations to the background server.”**

217. By my review, claims 9 and 16 depend from claims 7, and 14 respectively. Claims 9 and 16 are substantially similar to claim limitation 3.0,⁴ except that they recite a “method” and “non-transitory computer-readable storage medium storing therein a computer program for executing” instead of a “system.” The differences in wording between claim limitation 3.0 and claims 9 and 16 amount to insubstantial differences because each claim recites that a plurality of base stations receive the first data and attach an energy value to the received first data when forwarding it to the server. For the reasons I explained above for claim limitation 3.0, the combination of Nagata’s system (either alone or in combination with Hashiguchi) and Thubert renders obvious claims 9 and 16.

⁴ By my review, I see that Claims 9 and 16 do not include a claim limitation similar to that of claim limitation 3.1.

4. Claims 4, 10, 17: “wherein the background server is further configured to perform deduplication processing on the first data uploaded by the plurality of base stations.”

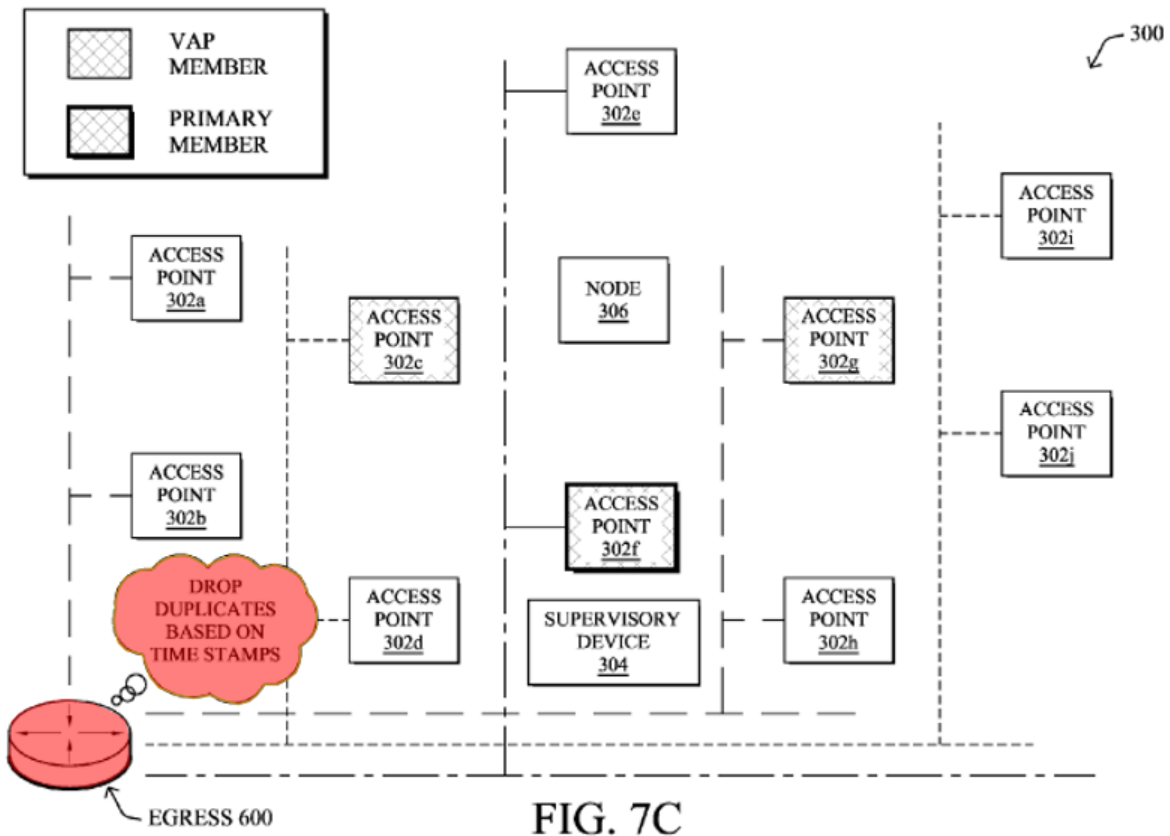
218. By my review, claims 4, 10, and 17 depend from claims 3, 9, and 16 respectively.

219. In my opinion, the Nagata-Thubert combination or Nagata-Hashiguchi-Thubert combination discloses or suggests the interactive electronic tag device communication system of claim 3 including a background server that receives first data as described in claim limitations 1.5, 3.0–3.1, above.

220. Additionally, it is my opinion that the Nagata-Thubert combination or Nagata-Hashiguchi-Thubert combination teaches claim 4. Specifically, a POSITA would have found it obvious to perform deduplication processing on data uploaded by a plurality of base stations, as in Thubert. This would reduce data redundancy at the server, which a POSITA would have recognized improves processing at the server by reducing data redundancy and increasing the reliability of network transmissions.

221. Thubert’s virtual access point enabled network maps the highest-signal quality access points to a node to help transmit messages from that node to a supervisory device. *Thubert*, [0016], [0094]. Continuing the example from claim 3, this means multiple mapped APs 302*f* and 302*g* may receive duplicate copies of the same message 702 from a mutually-mapped node 306. *Id.*, [0093]–[0094]. The

supervisory device uses its knowledge of the network topology for AP groupings to ensure each AP maintains a different network path to a “DetNet egress 600.” *Id.*, [0084]. This server-controlled traffic engineering enables the egress 600 to eliminate duplicate copies of the same message by comparing timestamps, tokens, MAC addresses, and other information attributes of that message as annotated in Figure. 7C, reproduced below:



Id., Fig. 7C (600), [0084], [0094]. A POSITA would have recognized the node message transmitted via access points to the supervisory device in Thubert’s network as a first data uploaded by a plurality of base stations to a supervisory device because

any information sent first from a node to a supervisory device through an access point is a “first data.”

222. By my review, both Nagata and Hashiguchi disclose that each label can communicate with multiple access points. *Nagata*, [0032] (“the electronic rack labels 40 installed inside the store can communicate with any of the access points 30”); *Hashiguchi*, [0031] (“The installation location, the installation spacing, and the like of the access points 30 are determined such that the electronic rack labels 40 installed in the store are capable of communicating with any of the access points 30.”). Therefore, a POSITA would have been motivated to implement Thubert’s teachings of deduplication in Nagata’s system (or the combination of Nagata and Hashiguchi) because it was well known and conventional to perform deduplication processing on data uploaded by a plurality of base stations to facilitate network diversity to improve wireless communications reliability. *Thubert*, [0017], [0051], [0078]–[0079], [0089]–[0090], [0094]. A POSITA would have been motivated to apply these well-known techniques to perform deduplication processing to reduce data redundancy, improve processing at the server, and make better use of available storage at the server, and increase the reliability of wireless networks in Nagata (or Nagata-Hashiguchi). *Id.*, [0074].

223. A POSITA would have had reasonable expectation of success in implementing deduplication processes, such disclosed in Thubert and recited in

claim 4 in Nagata's system (or the combination of Nagata and Hashiguchi) because it would have involved merely combining known prior art elements (Thubert's deduplication of information at Nagata's server (e.g., Thubert's system egress)) according to known methods (duplicating and eliminating redundant data based on known features such as time stamps or packet numbers) to yield predictable results (removing the duplicate data). *Id.*

224. Claims 10 and 17 are substantially similar to claim 4, except that they recite a "method" and "non-transitory computer-readable storage medium storing therein a computer program for executing" instead of a "system." For the reasons I explained above for claim 4, the combination of Nagata and Thubert renders obvious claims 4, 10 and 17.

XII. SECONDARY CONSIDERATIONS

225. At this stage of these proceedings, it is my understanding that Petitioner has no burden to identify and rebut secondary considerations. Rather, it is my understanding that Patent Owner must first present a prima facie case for such consideration, which Petitioners should then have the chance to rebut. That said, I have considered evidence of secondary considerations that I am aware of at this time, and I am currently unaware of any evidence of secondary considerations that would support a finding of non-obviousness.

XIII. CONCLUSION

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

Dated: May 1, 2024

Respectfully submitted,

A handwritten signature in dark ink, appearing to read 'Andrew Wolfe', is written over a horizontal line.

Andrew Wolfe, Ph.D.

LISTING OF CHALLENGED CLAIMS

Reference	Claim Limitation
Claim 1	
1.0	An interactive electronic tag device communication system, comprising:
1.1	a background server, a base station, an electronic tag device and an external device;
1.2	wherein the electronic tag device comprises two communication paths: a first communication path and a second communication path;
1.2.1	the first communication path supports two monitoring modes: a normal monitoring mode and a fast monitoring mode;
1.2.2	and the base station comprises two wake-up modes: a normal wake-up mode and a fast wake-up mode;
1.3	the external device is configured to transmit first data to the electronic tag device through the second communication path;
1.4	the electronic tag device is configured to receive the first data, transmit the first data to the base station through the first communication path, and enter the fast monitoring mode;
1.5	the base station is configured to receive the first data and transmit the first data to the background server;
1.6	the background server is configured to generate a control instruction and second data according to the first data, and transmit the control instruction and the second data to the base station;
1.7	the base station is further configured to receive the control instruction and the second data, communicate with the electronic tag device in the fast wake-up mode, and transmit a fast wake-up instruction, the control instruction and the second data to the electronic tag device through the first communication path; and
1.8	the electronic tag device is further configured to receive the fast wake-up instruction, the control instruction and the second data, and switch to the normal monitoring mode after completing the communication.

Reference	Claim Limitation
Claim 2	
2	The interactive electronic tag device communication system according to claim 1, wherein the electronic tag device is configured to attach an ID of the electronic tag device to the first data when transmitting the first data to the base station.
Claim 3	
3.0	The interactive electronic tag device communication system according to claim 1, wherein when the first data is received by a plurality of base stations, the plurality of base stations are configured to attach respective energy value information of the plurality of base stations to the first data when transmitting the first data to the background server;
3.1	the background server is configured to determine an optimal base station among the plurality of base stations according to the respective energy value information of the plurality of base stations, and transmit the control instruction and the second data to the electronic tag device through the optimal base station.
Claim 4	
4	The interactive electronic tag device communication system according to claim 3, wherein the background server is further configured to perform deduplication processing on the first data uploaded by the plurality of base stations.
Claim 5	
5	The interactive electronic tag device communication system according to claim 1, wherein the electronic tag device is further configured to switch to the normal monitoring mode when the fast wake-up instruction transmitted by the base station is not received within a preset time range.

Reference	Claim Limitation
Claim 6	
6	The interactive electronic tag device communication system according to claim 1, wherein the electronic tag device is further configured to switch to the normal monitoring mode when the fast wake-up instruction is received but the control instruction and the second data are not received within a preset time range.
Claim 7	
7.0	An interactive electronic tag device communication method, comprising:
7.1	transmitting, by an external device, first data to an electronic tag device through a second communication path in the electronic tag device;
7.2	receiving, by the electronic tag device, the first data, transmitting the first data to a base station through a first communication path in the electronic tag device, and entering a fast monitoring mode;
7.3	receiving, by the base station, the first data and transmitting the first data to a background server;
7.4	generating, by the background server, a control instruction and second data according to the first data, and transmitting the control instruction and the second data to the base station;
7.5	receiving, by the base station, the control instruction and the second data, communicating with the electronic tag device in a fast wake-up mode, and transmitting a fast wake-up instruction, the control instruction and the second data to the electronic tag device through the first communication path; and
7.6	receiving, by the electronic tag device, the fast wake-up instruction, the control instruction and the second data, and switching to a normal monitoring mode after completing the communication;

Reference	Claim Limitation
7.7	wherein the electronic tag device comprises two communication paths: the first communication path and the second communication path, the first communication path supports two monitoring modes: the normal monitoring mode and the fast monitoring mode, and the base station comprises two wake-up modes: a normal wake-up mode and the fast wake-up mode.
Claim 8	
8	The interactive electronic tag device communication method according to claim 7, wherein transmitting, by the electronic tag device, the first data to the base station comprises: attaching an ID of the electronic tag device to the first data, and transmitting the ID of the electronic tag device and the first data to the base station.
Claim 9	
9	The interactive electronic tag device communication method according to claim 7, wherein receiving, by the base station, the first data and transmitting the first data to a background server comprises: attaching, by a plurality of base stations, respective energy value information of the plurality of base stations to the first data when receiving the first data, and transmitting, by the plurality of base stations, the first data and the respective energy value information of the plurality of base stations to the background server.
Claim 10	
10	The interactive electronic tag device communication method according to claim 9, further comprising: performing, by the background server, deduplication processing on the first data uploaded by the plurality of base stations.

Reference	Claim Limitation
Claim 11	
11	The interactive electronic tag device communication method according to claim 7, further comprising: switching, by the electronic tag device, to a normal monitoring mode when the fast wake-up instruction transmitted by the base station is not received within a preset time range.
Claim 12	
12	The interactive electronic tag device communication method according to claim 7, further comprising: switching, by the electronic tag device, to the normal monitoring mode when the fast wake-up instruction is received but the control instruction and the second data are not received within a preset time range.
Claim 13	
13	A computer device comprising a memory, a processor and a computer program stored on the memory and executable by the processor, wherein the processor implements, when executing the computer program, the method according to claim 7.
Claim 14	
14.0	A non-transitory computer-readable storage medium storing therein a computer program for executing an interactive electronic tag device communication method comprising:
14.1	transmitting, by an external device, first data to an electronic tag device through a second communication path in the electronic tag device;
14.2	receiving, by the electronic tag device, the first data, transmitting the first data to a base station through a first communication path in the electronic tag device, and entering a fast monitoring mode;
14.3	receiving, by the base station, the first data and transmitting the first data to a background server;
14.4	generating, by the background server, a control instruction and second data according to the first data, and transmitting the control instruction and the second data to the base station;

Reference	Claim Limitation
14.5	receiving, by the base station, the control instruction and the second data, communicating with the electronic tag device in a fast wake-up mode, and transmitting a fast wake-up instruction, the control instruction and the second data to the electronic tag device through the first communication path; and
14.6	receiving, by the electronic tag device, the fast wake-up instruction, the control instruction and the second data, and switching to a normal monitoring mode after completing the communication;
14.7	wherein the electronic tag device comprises two communication paths: the first communication path and the second communication path, the first communication path supports two monitoring modes: the normal monitoring mode and the fast monitoring mode, and the base station comprises two wake-up modes: a normal wake-up mode and the fast wake-up mode.
Claim 15	
15	The non-transitory computer-readable storage medium according to claim 14, wherein transmitting, by the electronic tag device, the first data to the base station comprises: attaching an ID of the electronic tag device to the first data, and transmitting the ID of the electronic tag device and the first data to the base station.
Claim 16	
16	The non-transitory computer-readable storage medium according to claim 14, wherein receiving, by the base station, the first data and transmitting the first data to a background server comprises: attaching, by a plurality of base stations, respective energy value information of the plurality of base stations to the first data when receiving the first data, and transmitting, by the plurality of base stations, the first data and the respective energy value information of the plurality of base stations to the background server.

Reference	Claim Limitation
Claim 17	
17	The non-transitory computer-readable storage medium according to claim 16, wherein the computer program further executes the act of: performing, by the background server, deduplication processing on the first data uploaded by the plurality of base stations.
Claim 18	
18	The non-transitory computer-readable storage medium according to claim 14, wherein the computer program further executes the act of: switching, by the electronic tag device, to a normal monitoring mode when the fast wake-up instruction transmitted by the base station is not received within a preset time range.
Claim 19	
19	The non-transitory computer-readable storage medium according to claim 14, wherein the computer program further executes the act of: switching, by the electronic tag device, to the normal monitoring mode when the fast wake-up instruction is received but the control instruction and the second data are not received within a preset time range.

EXHIBIT LIST

Exhibit	Reference
1001	U.S. Patent No. 11,540,216 (“the ’216 patent”)
1002	File History of the ’216 patent
1003	Declaration of Dr. Andrew Wolfe in Support of Petition
1004	Dr. Andrew Wolfe CV
1005	Certified Translation of Japanese Published Unexamined Patent Application 2017-126872 (“Nagata”)
1006	Certified Translation of Japanese Published Unexamined Patent Application 2016-140368 (“Hashiguchi”)
1007	U.S. Patent Application Publication No. 2018/0123887 (“Thubert”)
1008	Complaint, <i>Hanshow Technology Co., Ltd. v. SES-imagotag SA et al.</i> , Case No. 2:23-cv-00174 (E.D. Tex.).
1009	Waiver of Service, <i>Hanshow Technology Co., Ltd. v. SES-imagotag SA et al.</i> , Case No. 2:23-cv-00174 (E.D. Tex.).
1010	Docket Control Order, <i>Hanshow Technology Co., Ltd. v. SES-imagotag SA et al.</i> , Case No. 2:23-cv-00174 (E.D. Tex.).
1011	Original Japanese Published Unexamined Patent Application 2017-126872 (“Nagata”)
1012	Original Japanese Published Unexamined Patent Application 2016-140368 (“Hashiguchi”)
1013	U.S. Patent No. 7,567,791 to Laroia, et al. (“Laroia”)
1014	U.S. Patent Application Publication No. 2017/0011238 to RÖßl et al. (“RÖßl”)
1015	Farhana Afroz et al., SINR, RSRP, RSSI and RSRQ Measurements in Long Term Evolution Networks, <i>International Journal of Wireless & Mobile Networks (IJWMN)</i> , Vol. 7, No. 4 (Aug. 2015) (“Afroz”)
1016	Bluetooth Core Specification v5.0, December 6, 2016

Exhibit	Reference
1017	Liu Weiyang, et al., “A low power 2.4 GHz transceiver for ZigBee applications,” Journal of Semiconductors, Vol. 34, No. 8 (Aug. 2013)
1018	Ben W. Cook, et al., “Low-Power 2.4-GHz Transceiver With Passive RX Front-End and 400-mV Supply,” IEEE Journal of Solid-State Circuits, Vol. 41, No. 12 (Dec. 2006)
1019	Abdellah Chehri, et al., “Link-Quality Measurement and Reporting in Wireless Sensor Networks,” Sensors Journal (2013)
1020	Baidoo-Williams, Henry, et al., “PHY-layer link quality indicators for wireless networks using matched-filters” (Aug. 2015)
1021	U.S. Patent Application Publication No. 2017/0330064 (“Kim”)
1022	U.S. Patent Application Publication No. 2015/0278890 (“Yang”)
1023	U.S. Patent Application Publication No. 2003/0133468 (“Haulk”)