

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HANSHOW AMERICA INC. AND HANSHOW
TECHNOLOGY CO., LTD.,

Petitioner,

v.

SES-IMAGOTAG INC.,

Patent Owner.

Case No. IPR2024-00189

Patent No. 10,674,340

**DECLARATION OF DR. RAJEEV SURATI,
IN SUPPORT OF PATENT OWNER RESPONSE**

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CLAIM LISTING

Claim 1	
[1pre]	A method for communicating spatially localized information to a mobile terminal, the method being performed by a central server configured to access a planogram associating a plurality of unique identifiers of radio-frequency peripherals with a plurality of locations within a predetermined area, each of the plurality of locations being defined by a vertical and horizontal position within a plane perpendicular to a floor of the predetermined area, and each of the plurality of locations being associated one-to-one with a corresponding unique identifier, the method comprising:
[1a]	receiving a communication from a mobile terminal, the communication comprising a unique identifier received by the mobile terminal from a radio-frequency peripheral located in the predetermined area, the unique identifier being particular to the radio-frequency peripheral, wherein the radio-frequency peripheral includes an antenna and an electronic chip configured for near-field communication, and is configured to be activated by the mobile terminal when the radio-frequency communication peripheral is within a communication range of the mobile terminal, wherein the communication range is less than twenty centimeters;
[1b]	determining a location of the mobile terminal within the predetermined area based on the location associated with the unique identifier of the received communication in the planogram, the location of the mobile terminal comprising the vertical and horizontal position of said location; and
[1c]	transmitting to the mobile terminal spatially localized information associated with the location of the mobile terminal.
Claim 2	
[2]	The method according to claim 1, further comprising: when the mobile terminal is positioned relative to the radio-frequency communication peripheral within the communication range, energy of electromagnetic waves emitted by the mobile terminal activating the radio-frequency communication peripheral, thereby setting-up a radio-frequency communication between the mobile terminal and the radio-frequency peripheral, wherein the communication range

	is a range of the electromagnetic waves emitted by the mobile terminal.
Claim 3	
[3]	The method according to claim 1, wherein the central server receiving the communication from the mobile terminal is via the Internet.
Claim 4	
[4]	The method according to claim 1, wherein the spatially localized information is further associated with account data specific to the user of the mobile terminal previously stored in a database accessible to the central server via a communication network.
Claim 5	
[5pre]	A system for communicating spatially localized information to a mobile terminal, the system comprising:
[5a]	a central server configured to access a planogram associating a plurality of unique identifiers of radio-frequency peripherals with a plurality of locations within a predetermined area, each of the plurality of locations being defined by a vertical and horizontal position within a vertical plane of the predetermined area, and each of the plurality of locations being associated one-to-one with a corresponding unique identifier;
[5b]	a mobile terminal configured to communicate with the central server; and
[5c]	a plurality of radio-frequency peripherals distributed throughout the predetermined area, wherein each radio-frequency peripheral includes an antenna and an electronic chip configured for near-field communication, and is configured to be activated by the mobile terminal when the radio-frequency communication peripheral is within a communication range of the mobile terminal, wherein the communication range is less than twenty centimeters,
[5d]	wherein the central server is configured to:
[5e]	receive a communication from a mobile terminal, the communication comprising a unique identifier received by the mobile terminal from a radio-frequency peripheral located in the

	predetermined area, the unique identifier being particular to the radio-frequency peripheral;
[5f]	determine a location of the mobile terminal within the predetermined area based on the location associated with the unique identifier of the received communication in the planogram, the location of the mobile terminal comprising the vertical and horizontal position of said location; and
[5g]	transmit to the mobile terminal spatially localized information associated with the location of the mobile terminal.
Claim 6	
[6pre]	The system according to claim 5, wherein at least one radio-frequency peripheral is an electronic label which comprises:
[6a]	a radio-frequency communication module configured to receive data representing information relating to an item from a central server;
[6b]	a memory to store said data;
[6c]	a microcontroller to control the display of information relating to an item;
[6d]	a display screen to display said item-related information.
Claim 7	
[7]	The system according to claim 6, wherein the mobile terminal is adapted to transmit data to the electronic label via the radio-frequency communication module of said electronic label.
Claim 8	
[8]	The system according to claim 5, wherein the chip and the antenna are arranged at different points of the radio-frequency peripheral, and wherein the radio-frequency peripheral comprises connections configured to ensure a communications link between the antenna and the chip.
Claim 9	
[9]	The system according to claim 8, wherein the chip is connected to a microcontroller of the radio-frequency peripheral, and wherein the antenna is arranged on or within a case inside which the microcontroller is housed.

I, Dr. Rajeev Surati, do hereby declare as follows:

I. INTRODUCTION

1. I make this declaration based upon my own personal knowledge and, if called upon to testify, would testify competently to the matters stated herein.

2. I have been asked by SES-Imagotag SA (“SES”) to provide my expert opinion connection with the *Inter Partes* Review (“IPR”) of U.S. Patent No. 10,674,340 (Ex-1001, “’340 Patent”). This declaration is a statement of my opinions on issues relating to the patentability of claims 1–9 (“the Challenged Claims”) of the ’340 Patent. As I explain more fully below, it is my opinion that all of the Challenged Claims would not have been unpatentable to a person of ordinary skill in the art (“POSITA”).

3. I am being compensated for my work in this matter at my standard hourly rate of \$650. I am also being reimbursed for reasonable and customary expenses associated with my work and testimony in this investigation. My compensation is not contingent on the outcome of this matter or the specifics of my testimony.

4. I have reviewed and considered at least the following documents in connection with my analysis of the ’340 Patent:

- Petition
- Patent owner preliminary response

- Institution decision
- U.S. Patent No. 10,674,340 (Ex-1001)
- File History of the '340 Patent (Ex-1002)
- Certified translation of Japan Patent Application Publication No. 2008-77131A by Fujiwara (“Fujiwara”) (Ex-1003)
- Japan Patent Application Publication No. 2008-77131A by Fujiwara (Ex-1004)
- International Patent Application Publication No. WO 2010/082835A1 by Arntzen (“Arntzen”) (Ex-1005)
- U.S. Patent Application Publication No. 2007/024436A1 by Bandy (“Bandy”) (Ex-1006)
- U.S. Patent Application Publication No. 2008/0231228A1 by Fowler (“Fowler”) (Ex-1007)
- Declaration of Dr. Manos M. Tentzeris (Ex-1009)
- U.S. Patent No. 8,049,621 (the “’621 patent”) (Ex-2003)
- U.S. Patent No. 7,949,568 (the “’568 patent”) (Ex-2004)
- U.S. Patent No. 7,957,998 (the “’998 patent”) (Ex-2005)
- Kumar et al., Overview of RFID Technology and Its Applications in the Food Industry, 74 J. FOOD SCIENCE 8 (2009) (“Kumar”) (Ex-2006)

- Rohde & Schwarz, Near Field Communication (NFC) Technology and Measurements, White Paper (2011) (“Rohde”) (Ex-2007)
- ISO/IEC 14443-2 (2010) (Ex-2008)
- ISO/IEC 15693-2 (2006) (Ex-2009)
- Alva, Near Field Communication (2010) (“Alva”) (Ex-2010)
- ISO/IEC 18092 (2004) (Ex-2011)
- ECMA-340, 2nd ed. (December 2004) (Ex-2012)
- U.S. Pat. No. 6,002,344 (Bandy ’344) (Ex-2013)
- Excerpt of Merriam-Webster’s Collegiate Dictionary, 11th ed. (2014) (Ex-2014)
- U.S. Patent No. 8,923,893 (the “’893 patent”) (Ex-2015)
- Edwin Bergsma, Planogram Data Requirements (2011) (Ex-2016)
- “Planograms 101: What They Are and Why They’re Important for Your Brand,” ePac (2024) (available at <https://epacflexibles.com/en-gh/planograms-101-what-they-are-and-why-theyre-important-for-your-brand/>) (Ex-2017)
- Erwin Bergsma, Analyzing your first planogram, Global Retail Business Solutions (Aug. 2015) (Ex-2018)
- Violino and Roberti, The History of RFID Technology, Rfid J. (Jan. 16, 2005) (“Violino”) (2005) (Ex-2019)

- U.S. Patent Application Publication No. 2010/0190484 (Ex-2020)
- U.S. Patent No. 7,809,402 (Ex-2021)
- U.S. Patent No. 7,546,948 (Ex-2022)
- Masao Ohta & Yoshiyuki Higuchi, Study on the Design of Supermarket Store Layouts: The Principle of “Sales Magnet,” 7 Int’l J. of Econ. Mgmt. Eng. 209 (2013) (Ex-2023)

5. In addition, although not filed as exhibits in this IPR, I have reviewed the following references discussed in paragraphs 46-51 of Dr. Tentzeris’s declaration:

- U.S. Patent Application Publication No. 2012/0059741¹
- U.S. Patent Application Publication No. 2014/0195925
- U.S. Patent No. 7,937,107
- U.S. Patent Application Publication No. 2010/0161434
- U.S. Patent Application Publication No. 2008/0255947
- Japan Patent Application Publication 2007-155383

6. In forming the opinions expressed below, I have considered:

- a) the documents listed above;
- b) the relevant legal standards, including the standard for

¹ Dr. Tentzeris incorrectly cites to this reference as “2012/059741.” Ex-1009, ¶46.

obviousness, and any additional authoritative documents as cited in the body of this declaration; and

- c) my own knowledge and experience based upon my work in the field of software systems as described below, as well as the following materials.

7. Unless otherwise noted, all emphasis in any quoted material has been added.

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

8. My complete qualifications and professional experience are described in my *Curriculum Vitae*, a copy of which can be found in Exhibit 2002. The following is a brief summary of my relevant qualifications and professional experience.

9. I have over thirty years of experience in electrical engineering and computer science.

10. I attended the Massachusetts Institute of Technology (MIT) from 1988 to 1999. I earned a Bachelor of Science in 1992, Master of Science in 1995, and a Doctor of Philosophy in 1999 in electrical engineering and computer science, all from MIT. During my studies, I took many classes where I built fully integrated hardware and software systems and worked on several projects involving RF (radio-frequency), proximity, IP (infrared), and microcontrollers. I also taught courses at

MIT on electronics, circuit design, signal processing, RF, electromagnetic systems, and other similar courses to undergraduates.

11. My Ph.D. thesis, “Scalable self-calibrating display technology for seamless large-scale displays,” focused on a system that took multiple projectors and calibrated them using optical feedback and user input to create imagery that looked like a single image across multiple projected images. My thesis resulted in a patent that is owned by MIT.

12. In 1996, I founded Flash Communications, a company focused on technology related to U.S. Patent No. 5,943,478 and associated technology that I had developed related to pop-up two-way messaging over the Internet. Flash Communications was sold to Microsoft Corporation in 1998.

13. In 2000, I started a company, photo.net, which was a large online photography community. Photo.net was also known as one of the earliest photo sharing web sites. During this time, I worked with consumer electronics manufacturers in the digital camera business.

14. I also founded Scalable Display Technologies in 2004 and have been the President and Chairman ever since. The products and services of the company are based on technologies developed for my Ph.D. thesis and related patents.

15. Since 2008, I have been working with many technologies for the purpose of tracking items such as blue tooth, Wi-Fi, and other frequencies, as well

as writing several applications for iOS and mobile phones. My projects also involve near-field communication (“NFC”) and radio-frequency identification (“RFID”) tags.

16. I am an inventor on several patents and have created several products that utilize optical feedback to control contrast and brightness of projectors at a display and per pixel level.

17. For my contributions as an inventor and entrepreneur, I have received several awards, including the Global Indus Technovator Award 2009 and Laureate of 2009 Computerworld Honors Program.

18. I have authored and co-authored over ten publications and presented talks on various aspects of electrical engineering and computer science, including my Bachelor of Science thesis entitled “A Parallelizing Compiler based on Partial Evaluation,” which was awarded the Best Undergraduate Thesis in Computer Science in 1992 at MIT.

19. I am on the advisory boards of several technology companies, including UnifySquare, a unified communications/Realtime collaboration consultancy; Paneve, a developer of general-purpose ASICs coupled with compiler technology; Nexaweb, a developer of Realtime web application frameworks using HTTPS; Antix Labs, a developer of compiler technology for universal gaming platform; and Permabit, a provider of an online to offline bridge for marketing using blue tooth

beacons.

III. LEVEL OF ORDINARY SKILL IN THE ART

20. I understand there are multiple factors relevant to determining the level of ordinary skill in the pertinent art, including (1) the levels of education and experience of persons working in the field at the time of the invention; (2) the sophistication of the technology; (3) the types of problems encountered in the field; and (4) the prior art solutions to those problems.

21. I understand that the '340 Patent was filed on February 21, 2019, but claims priority to an application filed on April 11, 2012. My analysis reflects the views of a person of ordinary skill in the art ("POSITA") in the field of the '340 Patent as of April 11, 2012.

22. For purposes of this *inter partes* review, I have been instructed to apply Petitioners' definition of a POSITA: that a POSITA would have at least a Master of Science Degree in an academic area emphasizing electrical engineering, computer engineering, wireless telecommunication systems, or an equivalent field (or a similar technical Master's Degree, or higher degree). Alternatively, a POSITA would have had a Bachelor's Degree (or higher degree) in an academic area emphasizing electrical engineering, computer engineering, wireless telecommunication systems, or an equivalent field with two or more years of work experience in electrical engineering, wireless telecommunication systems, computer engineering, or an

equivalent field. 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.

23. As of April 11, 2012, I met, and in fact exceeded, the qualifications of a person of ordinary skill in the art.

24. For purposes of this Declaration, in general, and unless otherwise noted, my statements and opinions, such as those regarding my experience and the understanding of a POSITA generally (and specifically related to the references I consulted herein), reflect the knowledge that existed in the field as of the earliest proper priority date of the '340 Patent (i.e., April 11, 2012). Unless otherwise stated, when I provide my understanding and analysis below, it is consistent with the level of a POSITA prior to the earliest alleged priority date of the '340 Patent.

IV. RELEVANT LEGAL STANDARDS

25. I am not an attorney. In preparing and expressing my opinions and considering the subject matter of the '340 Patent, I am relying on certain basic legal principles that counsel have explained to me. These principles are discussed below.

26. 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.

27. I understand the information 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.).

28. I understand that in this proceeding the Petitioner has the burden of proving that the claims of the '340 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.

29. I understand that prior art to the '340 Patent in this proceeding includes patents and printed publications in the relevant art that predate the proper priority date of the alleged invention recited in the '340 Patent.

30. I understand that in an IPR proceeding terms appearing in the patent claims are to be interpreted according to their “ordinary and customary meaning.” In determining the ordinary and customary meaning, the words of a claim are first given their plain meaning as they would have been understood by a POSITA at the time of the alleged invention, in light of the specification and file history. I understand that treatises and dictionaries may be consulted, albeit under limited circumstances, to determine the meaning attributed by a POSITA at the time of the alleged invention. I have followed this approach in my analysis and have applied the ordinary and customary meaning of those terms throughout my analysis in this

Declaration.

31. 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” because the Petition and expert declaration rely solely on “obviousness.” My understanding of the legal standard for “obviousness” is set forth below.

32. I have been informed that a claimed invention is unpatentable as obvious if the differences between the invention 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 the subject matter pertains. I have also been informed by counsel that the obviousness analysis takes into account factual inquiries including the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and the claimed subject matter.

33. 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.

34. I have been informed by counsel that the Supreme Court has recognized several rationales for combining references or modifying a reference to show obviousness of claimed subject matter. Some of these rationales include the following: (a) combining prior art elements according to known methods to yield predictable results; (b) simple substitution of one known element for another to obtain predictable results; (c) use of a known technique to improve a similar device (method, or product) in the same way; (d) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (e) choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and (f) some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

35. I further understand that certain factors may support or rebut the obviousness of a claim. I understand that such “secondary considerations” include, among other things, commercial success of the patented invention, skepticism of those having ordinary skill in the art at the time of invention, unexpected results of the invention, any long-felt but unsolved need in the art that was satisfied by the alleged invention, the failure of others to make the alleged invention, praise of the

alleged invention by those having ordinary skill in the art, and copying of the alleged invention by others in the field. I understand that there must be a nexus—a connection—between any such secondary considerations and the alleged invention.

36. I understand that for a claim to be valid, its scope must be definite. 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.

37. I understand that there is a high standard before a party can rely on inherency to establish the existence of a claim limitation in the prior art in an obviousness analysis. Even if a certain thing may result from a given set of circumstances, I understand that is not enough to render the result inherent. I also understand that an element can only be inherently disclosed if it is necessarily present in the prior art, not just probably or possibly present. Yet, even if an element is inherent, I understand that it is not necessarily obvious.

38. I understand that it is not permissible to use hindsight after viewing a claimed invention to then determine whether it is obvious. In other words, I understand that it is impermissible to engage in hindsight reconstruction of the claimed invention using the application as a template and using elements from

references to fill in any gaps. I also understand the inventor's own path never leads to obviousness. Even defining a problem in terms of its solution, I understand, will reveal improper hindsight in selecting the prior art relevant to obviousness.

39. I further understand that a petitioner may not prove obviousness with mere conclusory statements. I understand that obviousness must be supported by some articulated reasoning with some rational underpinning such that conclusory expert testimony is inadequate to support an obviousness determination. I understand that merely repeating an argument from the petition in a declaration is insufficient and lacks probative value.

V. OVERVIEW OF THE TECHNOLOGY

40. In retail stores, goods are displayed on shelves, and the placement of products on shelves is determined by a "planogram." Ex-2003 at 6:58-7:6 (U.S. Patent No. 8,049,621 (the "'621 patent")). In accordance with the planogram, shelf fronts (e.g., rails) may include labels displaying information about the goods (e.g., price). Ex-1001, 1:19-24; Ex-2004 at 7:64-8:8 (U.S. Patent No. 7,949,568 (the "'568 patent'")). Traditionally, a grocery store shelf containing cereal might include a paper label on the shelf rail identifying the brand and the price of each carton. If the store decides to instead display soup in this location, the existing label for cereal on the shelf rail would be removed and replaced with a new label providing information about the cheese now in that location. Ex-2005 at 9:56-62 (discussing pre-printed

labels needing to be replaced) (U.S. Patent No. 7,957,998 (the “’998 patent”)); Ex-2004 at 1:19-43, 1:57-60 (describing the labor-intensive process of managing out of stock displays and display tasks) (’568 patent)).

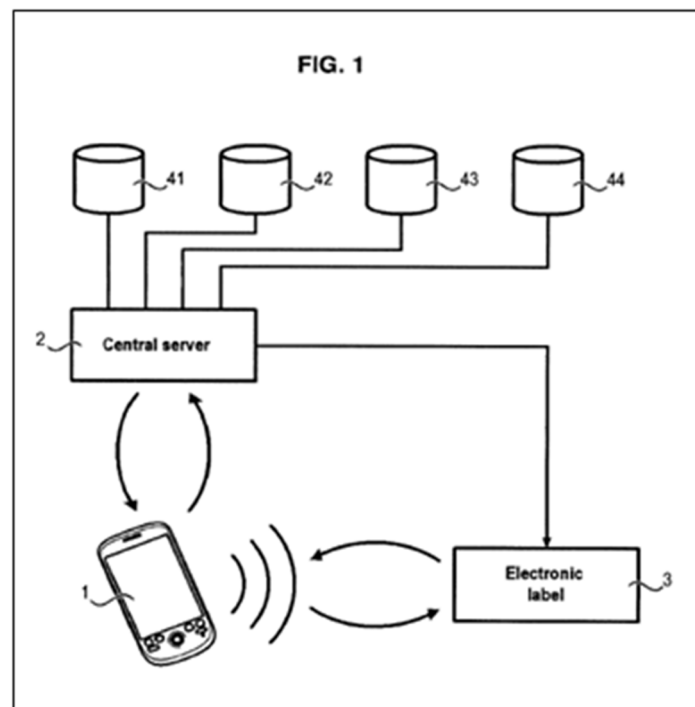
41. Electronic shelf labels are used to instead automate the display of information about an item placed according to a planogram. Ex-1001, 1:14-2:4. There are several advantages to electronic labels over their paper cousins, including allowing automated price changes. *Id.*, 1:36-42. But at the time of the invention, electronic label systems were “relatively rigid” in their display possibilities and often could only update price. *Id.*, 1:48-56.

A. Overview of the ’340 Patent

42. By my review, the ’340 Patent relates to providing consumers with spatially localized information in relation to the place and context of a consumer and allows customers to receive personalized information in relation to the location of a mobile terminal and electronic labels with identifiers. Ex-1001, 2:8-14, 7:4-15. Providing such information to a shopper requires knowing their precise location in reference to the item that the shopper is interested in. For example, once the precise location of the shopper is known, they can be guided to specific goods with centimeter accuracy. Ex-1001, 7:55-59. The ’340 Patent describes systems and methods directed to such precise location determination with both vertical and horizontal positions and the provision of information relevant to a shopper at that

precise location. *Id.*, Abstract. The exact location is known based on a planogram. *Id.*, 6:29-36.

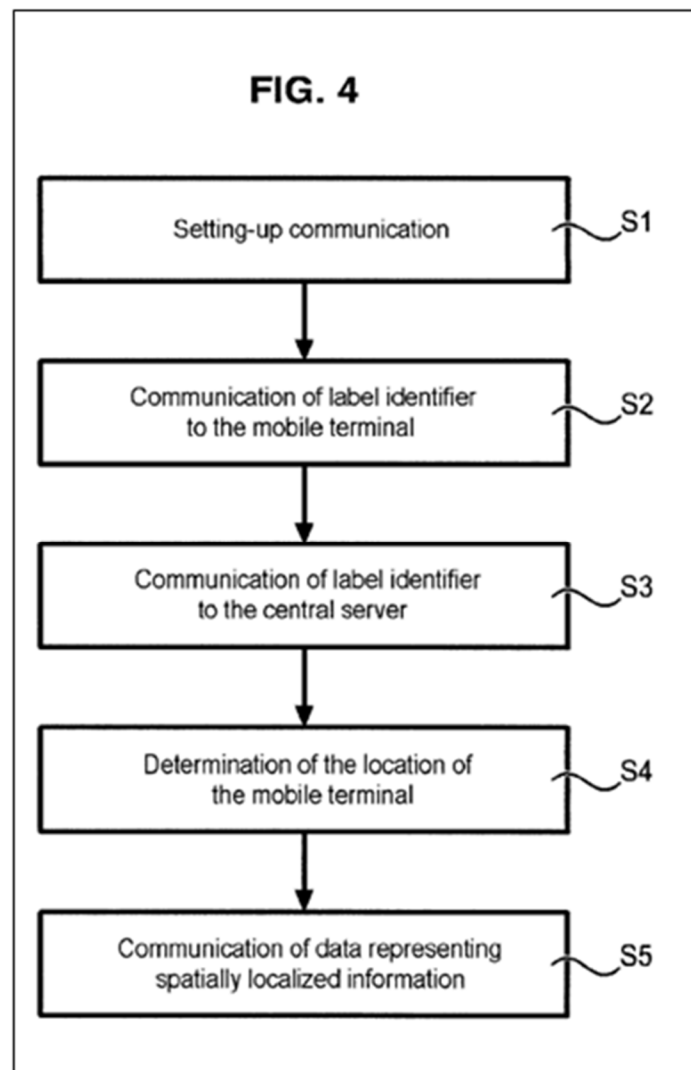
43. I have reproduced Figure 1 of the '340 Patent below showing one example of a communication system, where a customer has a “mobile terminal,” here, a phone, that can communicate with a central server through Wi-Fi, 3G, or other types of at least partly wireless communication network or wireless network. *Id.*, 3:45-47, 3:59-4:6. Electronic shelf labels having unique label identifiers are distributed throughout the sales area the customer is in. *Id.*, 3:59-4:28.



Ex-1001, Fig. 1.

44. I have reproduced Figure 4 of the '340 Patent below showing the mobile terminal activating the shelf label via the energy in its emitted electro-

magnetic waves, which sets up communication with the label. The frequency of the electromagnetic waves is, for example, 13.56MHz. *Id.*, 4:54-56. At this frequency, the shelf label can operate using either near-field communication or high-frequency radiofrequency identification (“RFID HF”). *Id.*, 4:50-56. In response to the activation, the label provides its unique identifier to the mobile terminal, which then communicates with a server. *Id.*, 6:11-20.



Ex-1001, Fig. 4.

The server determines the precise location of the mobile terminal using the planogram data “associating a location with the label identifier.” *Id.*, 6:29-35. The planogram lists the locations of all electronic labels and items on sale in the sales area. *Id.*, 6:35-37.

45. According to the '340 Patent, it is the uniqueness of the label identifier and “of the location associated” with an electronic label that allows for the determination of the label’s location. *Id.*, 6:43-51. This determination is “unambiguous,” including when the communication distance is kept to a minimum between the mobile terminal and label, or where there is a “short range” which is “require[d].” *Id.*, 6:59-61. Once the unique location of the mobile terminal is identified based on the label’s location, additional information can be provided to the user or shopper from the mobile terminal or phone. *Id.*, 6:66-7:14, 7:50-59.

46. The type of communication the label uses with the mobile terminal is critical. *See id.*, 6:52-65. The '340 Patent discloses that a “relatively short range” is required. Specifically, the '340 Patent discloses:

However, in all cases, this communication distance with the radiofrequency peripheral 36 must be chosen to be relatively short, less than 20 cm, and further preferably less than 10 cm from the antenna 38. (Ex-1001, 5:45-48).

The communication range of the radio-frequency peripheral 36 is preferably less than 20 cm, more preferably less than 10 cm, and is even 5 cm. (*Id.*, 6:52-54)

47. A range of less than 20 cm is used for three reasons. First, the short range is necessary ensure matching of the location of the mobile terminal to the location of the label. *Id.*, 6:54-56. Second, the short range avoids interference with other labels. *Id.*, 6:56-58. Third, the short range is important for security reasons. *Id.*, 6:59-65. Specifically, the '340 Patent discloses:

A relatively short range firstly ensures matching between the location of the electronic label 3 and the mobile terminal 1 and secondly allows interference to be limited between electronic labels when they are positioned close to one another.

In addition, a short range requires deliberate action by the user of the mobile terminal 1 to set up communication between the mobile terminal 1 and the electronic label 3. The user then has no reason to fear for the protection of private life and since the system proves to be little intrusive it cannot easily be diverted from its primary vocation set forth in this description. (*Id.*, 6:54-65).

B. Prosecution History

48. I understand the '340 Patent issued from U.S. Patent Application No. 16/281,190 that was filed on Feb. 21, 2019. The '340 Patent claim earlier priority to Application No. PCT/FR2012/050791, filed on April 11, 2012. As I explained above, for purposes of this declaration, I treat April 11, 2012, as the priority date for the '340 Patent.

49. I note that on April 23, 2019, Applicant submitted an information

disclosure sheet identifying Fujiwara. *See* Ex-1002 at 102. The Examiner considered Fujiwara but did not issue a rejection based on it. *See id.*, 59.

50. By my review, the Examiner and Applicant exchanged a single non-final Office Action based on the combination of U.S. Publication No. 2013/0048721 (“*Rasband*”) in view of U.S. Patent 8,049,621 (“*Egan*”) and U.S. Patent 8,228,196 (“*Thornton*”). *See* Ex-1002, 39-48. The Applicant explained that there was no indication that the Examiner’s reference covered item data that is spatially localized information associated with a location of a mobile terminal. *See id.*, 32-37. Further, the Applicant distinguished the cited references for lacking several elements: a description of determining a location of a mobile terminal within a predetermined area based on a location associated with a unique identifier of a received communication in a planogram; explanation as to how the horizontal and vertical coordinates sensed by the antennas are used, if at all; and whether horizontal or vertical coordinates are included in a planogram. *Id.*

51. Further, my review shows that the Applicant said that the Examiner’s combination engaged in “impermissible hindsight reconstruction” that used the application’s own specification and claims to “fill the gaps in the cited art” contrary to what a POSITA would have done at the time of the invention or understood. *Id.*, 36.

52. The Examiner allowed the application. *Id.*, 7-13. The ’340 Patent issued

on June 2, 2020. Ex-1001, Cover.

C. Overview of Radio-frequency Identification and Near-field Communication

53. The '340 Patent claims the use of NFC in a “radio-frequency peripheral.” Ex-1001, Claims 1 & 5. The specification also describes the used of “RFID HF.” *Id.*, 4:50-67. Below I provide a short overview of both RFID and NFC.

54. I also note that Dr. Tentzeris’s “BACKGROUND KNOWLEDGE OF A POSITA AT THE TIME OF THE CLAIMED INVENTION” (Ex-1009, ¶¶45-54), cites to several patents and publications that are not filed as exhibits in this IPR. Specifically, he cites to:

- U.S. Patent Application Publication No. 2012/0059741
- U.S. Patent Application Publication No. 2014/0195925
- U.S. Patent No. 7,937,107
- U.S. Patent Application Publication No. 2010/0161434
- U.S. Patent Application Publication No. 2008/0255947
- Japan Patent Application Publication 2007-155383

1. RFID

55. Radiofrequency identification, or RFID, is a type of wireless technology that uses radio waves to communicate with small devices, making it useful for tracking people or objects. Ex-2006 at R104 (Kumar et al., Overview of

RFID Technology and Its Applications in the Food Industry, 74 J. FOOD SCIENCE 8 (2009) (“Kumar”)) (defining an RFID tag as “a small device that can be attached to an object so that the object could be identified and tracked.”). RFID systems are generally made up of three components: tags, readers, and a backend system. *Id.* at R101-102. Tags can store a variety of information, from a single serial number to multiple pages of data. Ex-2007 at 12 (Rohde & Schwarz, Near Field Communication (NFC) Technology and Measurements, White Paper (2011) (“Rohde”))). Readers emit radio waves and receive signals back from the tags. The backend system can be a server that manages and processes the information collected by the tags and readers. Ex-2003 4:35-54 (the “’621 patent”)) (describing a “central processing system database” and facility servers).

56. Although around since WWII, the first U.S. patent on active RFID technology in 1973 covered one component, tags, having rewritable memory. Ex-2019 (Violino and Roberti, The History of RFID Technology, RFID J. (Jan. 16, 2005) (“Violino”) (2005))). RFID tags are categorized according to the frequency at which they operate. There are four primary frequencies ranges of RFID tags, which is often how they are categorized: Low frequency (LF) (30-300KHz); High frequency (HF) (3-30MHz); Ultra high frequency (UHF) (300-1000MHz); and Microwave frequency (microwave) (1-10GHz). Ex-2006 at R101 (Kumar). Thus, RFID tags operate at a variety of frequencies and those frequencies dictate the

conditions over which the RFID tag can operate, and necessitate certain hardware configurations. Early uses for RFID tags were to track animals and nuclear material. Ex-2019 (Violino). These tags used the LF and UHF frequency range. *Id.* By the 1990s, RFID tags had evolved from LF to HF to UHF tags.

57. RFID tags are small, electronic devices that store and transmit information and can be attached to objects like products or assets. Ex-2006 at R101 (Kumar) (“Tags are available in many different shapes, sizes, and protective housing.”). They are either active tags with a “battery to power up its microchip” or passive tags powered by the reader. *Id.* Active tags also transmit the same way as readers do and have a longer range than passive tags. *Id.* Passive tags typically use inductive coupling or use backscatter to communicate, depending on the frequency used, as explained below. *Id.* (“Passive tags do not require any power source.”). In other words, active RFID tags communicate by powering an antenna and transmitting radio or magnetic fields, whereas passive RFID tags used the received energy in the signal transmitted to it by the reader to produce power and to allow for manipulating the received signal to communicate back to the reader.

58. Two standards, ISO/IEC 15693 and ISO/IEC 14443 are applied to RFID HF readers. Ex-2010 at 3 (Alva, Near Field Communication (2010) (“Alva”)). Passive HF tags generally operate at 13.56Mhz with a range of 20cm. *Id.*, 4. Passive HF tags use inductive coupling, which uses an omnidirectional magnetic flux from

the reader in order to power the tag, transferring energy between the two components through a shared magnetic field. Ex-2006, R102. One can communicate data by changing either the current flow or impedance of the circuits. *Id.* Magnetic flux is used to communicate both power and data. Inductively coupled tags generally have wound antennas with an air core, such that the magnetic flux passes through the antenna and induces a current in the antenna.

59. For an RFID system operating at 13.56 MHz, the approximate distance at which the near-field zone ends is $\lambda/2\pi$, or 3.5 meters. Beyond this distance, the magnetic field is reduced so low that tags cannot be powered. Due to this, the typical read range for 13.56 MHz tags is less than 1 meter (or 3 feet). The read distance depends on the size of the antenna in the reader and tag. Typical HF handheld interrogators can read a small tag from about 2 inches. An interrogator with a large antenna can read a tag up to 2 feet away. Inductively coupled systems are affected by water or human tissue and are sensitive to metal (conducting material) in the operating zone. Also, as the magnetic field has vector characteristics, the tag orientation influences performance of the system. Since inductive RFID systems are operated in the near-field, interference from adjacent systems is lower compared to radiatively coupled systems.

60. Passive microwave and UHF tags use radiative coupling to communicate and have a range of several feet, depending on antenna size. They

backscatter energy received from the reader, which in turn, travels through the tag's antenna and activates the chip. Ex-2006 at R103 (Kumar) ("Tags using backscatter reflect part of the electromagnetic wave sent from the reader, back to the reader."). The received energy travels through the tag's internal antenna, activates the chip and the remaining energy is modulated with the chip's data and flows back via the tag's antenna to the reader's antenna in the form of electromagnetic waves. *Id.* Microwave and UHF tags generally have serpentine or other types of antennas to direct the radiated field in particular directions. Thus, unlike inductive coupling, microwave and UHF readers can use directional antennas. *Id.*, R102.

61. I will now explain backscattering in more detail. An electromagnetic field propagates outward from the reader's antenna, and a small proportion of that field (reduced by free-space attenuation) reaches the tag's antenna. The power is supplied to the antenna connections as high-frequency voltage, and after rectification by diodes it can be used to power the tag. Some proportion of the incoming RF energy is reflected by the antenna and reradiated outward into free space. The amount of energy reflected depends on how well the antenna couples to the electromagnetic wave. RFID tags that use backscatter to reply to their readers have antennas that are designed to resonate well with the carrier signal emitted by the interrogator. The reflection characteristics of the antenna, its effective cross-section, can be influenced by altering the load connected to the antenna. To transmit data

from the tag to the reader, a load resistor connected in parallel with the antenna is switched on and off in time with the data stream to be transmitted. By changing resonant properties of its antenna, the tag makes itself a good or poor reflector. This varies the strength of the signal reflected from the tag, creating a pattern that is detected at the interrogator as data. This technique is referred to as modulated backscatter.

62. Before the backscattered signal arrives at the reader antenna, it goes through forward and backward path loss, many types of interferences in both the directions, and absorption by the tag to power it. The reflected signal also travels into the antenna connection of the reader in the reverse direction from the original signal. It is decoupled using a directional coupler and transferred to the receiver input of the interrogator. The forward signal of the transmitter is to a large degree suppressed by the directional coupler.

2. NFC

63. Near-field communication, or NFC, is “short-range wireless connectivity technology” that allows two devices to exchange data. Ex-2007 at 3 (Rohde). NFC is commonly used for contactless or “cashless” payment systems, such as Apple Pay, Android Pay, and Samsung Pay. It can also be used for access control systems, like keyless entry to buildings or hotel rooms. Although the NFC Forum was formed in 2004, it wasn’t until 2006 that companies produced the first

set of NFC tags. The first Android phone incorporating NFC was manufactured in 2010. Ex-2007 at 3-4, 8 (Rhode).

64. The NFC Forum, an organization that develops and promotes NFC technology standards, was formed in 2004. The NFC Forum governs NFC standards. ISO/IEC 18092 specification (Ex-2011) (also known as ECMA-340 (Ex-2012)) governs NFC readers and devices. Ex-2007 at 3 (Rhode). The NFC specifications include other specifications, such as ISO/IEC 14443. *Id.* NFC operates in the high-frequency range at 13.56MHz. *Id.* However, NFC's range is limited to several centimeters. *Id.*; Ex-2010, 4. Furthermore, although the range of NFC is limited, standard NFC is not protected against eavesdropping and can be vulnerable to data modifications. Ex-2010 at 11-12 (Alva) ("NFC offers no protection against eavesdropping.").

65. While NFC readers can read RFID HF devices, RFID HF readers must be specifically designed to read NFC devices. Ex-2010 at 3, 9 (Alva). NFC always involves an initiator (reader) and a target (tag), where the initiator actively generates an electromagnetic field that can power a passive target. Ex-2007 at 5 (Rhode). This enables NFC targets to take very simple form factors such as unpowered tags, stickers, key fobs, or cards. Like RFID HF, NFC uses inductive coupling between two nearby loop antennas effectively forming an air-core transformer. *Id.*

66. NFC gets its name because the distances involved are tiny compared to

the wavelength of the radio waves at 13.56MHz (about 22 meters), the interaction is described as “near field.” An alternating magnetic field is used to couple the NFC tag and reader and allow communication and almost no power is radiated in the form of radio waves. Ex-2010 at 4 (Alva). Because of the lack of emitted radio waves, interference with other RF devices at the same frequency is minimized.

67. In addition to its communication range, there are further constraints on communication with an NFC tag. Because of the NFC’s use of magnetic fields, standard tags will fail when placed on a metal surface or near a liquid. Ex-2007 at 5 (Rhode) (describing metal as a barrier); Ex-2010 at 11 (Alva). Thus, special materials or distance between the antenna and the metal or liquid is required to read an NFC tag. Ex-2007, R105 (Rohde). The orientation of the reader to the tag is also critical when reading an NFC tag, for example, because a tag cannot be read if the tag antenna is perpendicular to the reader or if the tag is side-by-side with the reader at a distance. Thus, NFC tags operate at frequencies that, like RFID, dictate the conditions over which the tag can operate and that necessitate certain hardware configurations.

VI. CLAIM CONSTRUCTION

68. It is my understanding that in order to properly evaluate the ’340 Patent, the terms of the claims must first be interpreted. It is my understanding that for the purposes of this inter partes review, the claims are to be construed under the so-

called *Phillips* standard, under which claim terms are given their ordinary and customary meaning as would have been understood by one of ordinary skill in the art in light of the specification and prosecution history, unless the inventor has set forth a special meaning for a term.

69. I have been asked to provide my opinion on the proper meaning of “planogram” as recited in independent claims 1 and 5. I have also been asked to provide my opinion on the meaning of “activated” (independent claims) and as also recited in claim 2. Furthermore, I have been asked to assume the preamble of claim 1 is limiting. I understand that when a preamble is limiting, it limits the claim and the prior art must disclose or render the preamble obvious in order to render the claim obvious.

70. For the purposes of this declaration, I have given all other 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 April 11, 2012, for all claims.

A. “planogram”

71. I understand that the parties also dispute the meaning of the term “planogram,” which appears throughout the challenged claims. *See, e.g.,* Ex-1001, cl. 1 (claiming a server “configured to access a *planogram* associating a plurality of unique identifiers ... with a plurality of locations within a predetermined area, each

of the plurality of locations being defined by a vertical and horizontal position within a plane perpendicular to a floor of the predetermined area, and each of the plurality of locations being associated one-to-one with a corresponding unique identifier... [and] determining a location of the mobile terminal ... based on the location associated with the unique identifier ... in the *planogram*.”), cl. 5 (materially same).

72. As anyone who visits supermarkets may recognize, it is common for products to be grouped together and placed in specific locations. For instance, all produce is generally provided in the same area, and the produce section is typically placed close to the entrance of the supermarket. *See* Ex-2023, 210 (Masao Ohta). Within the produce section, the products are further grouped by type—such as popular fruits (apples, bananas, etc.), citruses (lemons, limes, oranges), in-ground produce (potatoes, onions), and herbs (basil, parsley, dill, etc.)—and then each product is given some defined amount of space in the produce section. Retail stores from electronics to hardware generally follow this same approach.

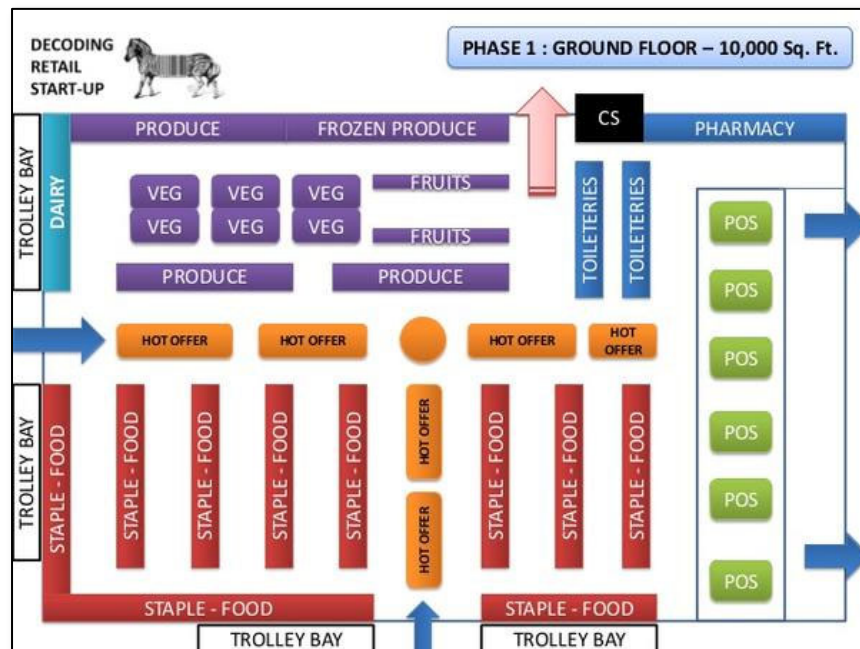
73. The term “planogram” is well-known in the retail arts to generally describe a dataset, map, diagram, schematic, or similar types of information, that allows retailers to accurately plan out the placement of products in a retail store in an effort to maximize sales. For instance, Merriam-Webster defines “planogram” as “*a schematic drawing or plan* for displaying merchandise in a store so as to maximize sales.” Ex-2014 (Merriam Webster). Moreover, the term is used

throughout other patents as some sort of detailed schematic or plan that represents a retail area and how products are displayed. *See, e.g.*, Ex-2015, 1:12-21 (“A planogram...is a diagram of fixtures, fittings and products that illustrates how and where retail products should be displayed.”); Ex-2005, 1:31-36 (“***A planogram is a layout, or ‘blueprint’***, that assigns a specific display location on a specific display fixture within a retail store to each product to be displayed.”).

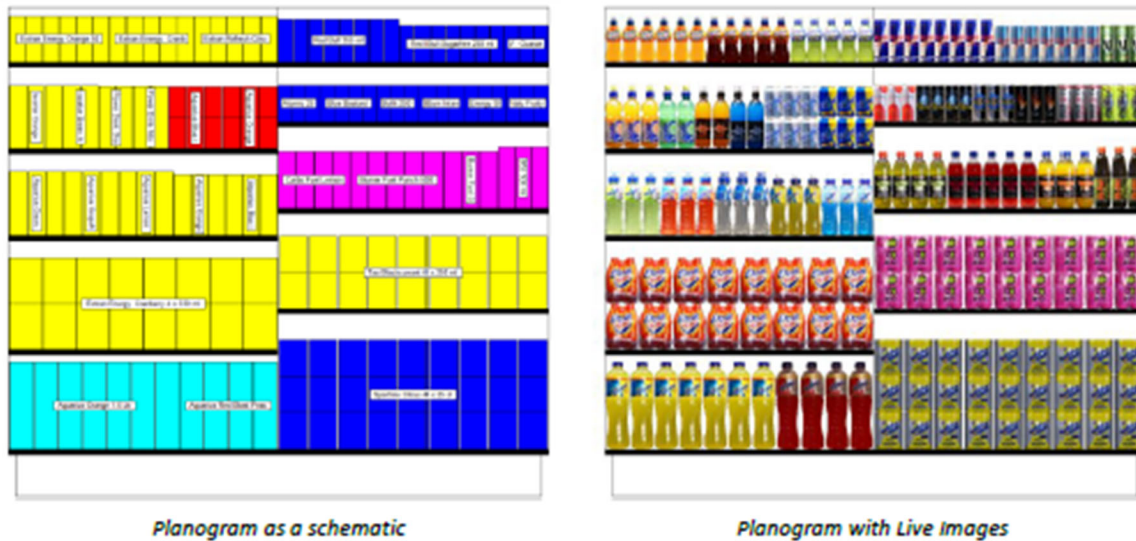
74. Although there are many different definitions of planogram throughout the art, they all share common features. Specifically, “planograms” generally include information regarding: (1) how similar products are grouped together and where these groups of products are placed in the retail store; (2) where each product is placed on a retail shelf-segment, including relative to other products (e.g., how high off the ground, how prominent a position, which products are nearby, etc.); and (3) how much shelf space is dedicated to each product. *See, e.g.*, Ex-2016 at 4-10 (providing an overview of the different layers of data used to build a planogram, depending on the need and data available, including how products are grouped, how much space should be allocated to each product, and product-performance data to decide which products to prioritize); Ex-2004 at 5:57-61 (“a planogram is, at a minimum, a list of products..., ***positions of the products (e.g., x, y, z coordinates for the center of product)*** and orientations....”); Ex-2015, 1:12-21 (“An essential part of creating a planogram is collecting information about the geometry of the

underlying retail space (floor levels, walls, doors, obstructions, etc.) and location and size of fixtures (shelves, racks, display cases, etc.) and fittings (power outlets, communication devices, points-of-sale, etc.).”); Ex-2005, 1:31-36 (“[A] planogram may assign each product to a specific location on specific shelf or to a specific hook of a specific peg grouping of a particular display fixture within the retail store.”).

75. A “planogram” can also be presented in several ways, such as a top-down map that depicts how products are grouped together:



Ex-2017 (depicting an exemplary top-down planogram). Additionally, or alternatively, a “planogram” can depict a shelf segment that shows exactly which products are supposed to be at which locations, and over how much shelf space:



Ex-2016, 5.

76. Thus, although there are a variety of definitions of “planogram,” and a “planogram” can take on many forms, they all generally share a few common features, such as how products are grouped, where they are placed, and how much space they are provided. I also understand “planograms” to generally serve a common purpose: so that retailers can plan, track, and make decisions about the placement of products throughout a retail store in an effort to maximize sales. Ex-2018, 4 (providing example questions planograms can help answer, such as “Do my products get their fair share of shelf space?” and “Is the planogram that I made implementable in the stores?”).

77. In my opinion, a POSITA would understand that the ’340 Patent uses the word “planogram” consistent with this general understanding. For instance, the ’340 Patent appears to discuss a shelf-segment-type planogram (as I have shown

in the exemplary figures above) because the patent specifies that the planogram defines locations “by a vertical and horizontal position within a plane perpendicular to a floor” with each location “being associated one-to-one with a corresponding unique identifier” of an ESL. Ex-1001, cls. 1, 5. In other words, the ’340 Patent uses the term “planogram” to refer to some sort of dataset, map, or diagram that has at least a two-dimensional coordinate system along a plane parallel to the shelves faces. But, in my opinion, a POSITA would also understand that, because the ’340 Patent is concerned with identifying the location of a reader device *in a retail area* to (optionally) provide directions throughout the entire store, the ’340 Patent’s planogram also has location information in a third dimension that characterizes locations in a plane *parallel* to the floor of the retail area. *See, e.g.*, Ex-1001, 2:16-22 (“representing spatially localized information, to a mobile terminal in relation to the location of the mobile terminal *in a sales area*”); 6:35-37 (“A planogram lists the locations of *all* the electronic labels 3 and of the items on sale in a sales area.”); 6:48-51 (“The mobile terminal 1 is effectively positioned in the immediate vicinity of the electronic label 3 from which it has acquired the identifier, so that the locating of the label allows determination of the location of the mobile terminal 1.”); 7:34-40 (“Knowing the location of the mobile terminal 1, it is then possible *to indicate to the user the direction of an item on the shopping list and thereby plan the circuit to be followed by the user within the sales area.*”). In other words, the ’340 Patent’s

use of the term “planogram” requires knowing the relationship between the locations of items throughout the entire retail area.

78. In my opinion, the prosecution history further clarifies that the ’340 Patent uses the term “planogram” consistent with its plain meaning. For instance, in response to an initial rejection of the claims, I understand that the Applicant acknowledged that one of the prior-art references (Egan) describes “implementing a planogram *to collect and analyze sales data in order to optimize future product offerings (e.g., identifying particular product placement configurations, or adjacencies, that maximize sales)*,” and distinguished Egan from the claims on another basis. Ex-1002, 35; *see also id.* (“Egan generally describes a planogram that is implemented for planners to collect and analyze sales data to optimize future offerings.” (original emphases)). Thus, in my opinion, the Applicant was acknowledging that the term “planogram” has a, and in the context of the ’340 Patent was taking on its, plain meaning.

79. For these reasons, in my opinion, a POSITA would understand that the term “planogram” as a generally understood meaning in the art that has a set of common features (which I have described above), and that the ’709 Patent was using the term consistent with that plain meaning.

B. “activated”/“activating”

80. The term “activated” and “activating” appears throughout independent

claims 1 and 5, and dependent claim 2. *See, e.g.*, Ex-1001, cls. 1 (“wherein the radio-frequency peripheral includes an antenna and an electronic chip ... configured to be **activated** by the mobile terminal.”), 2 (“the mobile terminal **activating** the radio-frequency communication peripheral.”), 2 (“the mobile terminal activating the radio-frequency communication peripheral.”), 5.

81. In my opinion, a POSITA would have understood that, in the context of the '340 Patent, the terms “activated” and “activating” means “powered” or “powering,” in that the radio-frequency peripheral is **powered** by the mobile terminal. Specifically, the '340 specification (which is also reflected in the claims) explains that the radio-frequency peripheral uses near-field communication (or “NFC”) to activate and set up communication with the mobile terminal. Ex-1001, 5:65-67. In particular, the radio-frequency peripheral is activated when it “comes within the range of the electromagnetic waves emitted by the mobile terminal 1,” and “the energy of the electromagnetic waves emitted by the mobile terminal” is used to activate peripheral. *Id.*, 6:1-9. In my opinion, this is consistent with—and a POSITA would understand the '340 Patent as referring to—a **passive** radio-frequency peripheral that requires an external (wireless) power source to establish communication. *See* Sections V.C. This understanding is also consistent with the ISO/IEC 14443-2 and ISO/IEC 18092 standards, which specify that the tags are activated by power transfer, in particular through magnetic induction. Ex-2008 at V

(“The interface includes both power and bidirectional communication.”) (ISO/IEC 14443-2); Ex-2011 at 30 (“The Target gets power from the operating field generated by the Initiator”) (ISO/IEC 18092).

82. The petition appears to recognize that the ’340 Patent relates to passive tags that are powered and activated wirelessly as well. For instance, the petition states that “NFC tags are activated *passive* RFID tags *powered and activated by electromagnetic waves*,” Petition, 39, and that “NFC communication...employs the claimed *electromagnetic wave activation*,” *id.*, 54. The Petition also references some of the same ISO/IEC standards which I refer to above. *Id.*, 71, 90 (referencing ISO 14443).

83. Thus, based on the ’340 Patent’s intrinsic disclosure and my understanding of the relevant standards, in my opinion, a POSITA would have understood that to “activate” the radio-frequency peripheral is to power it so that reciprocal communication can be setup with it.

VII. ASSERTED PRIOR ART REFERENCES

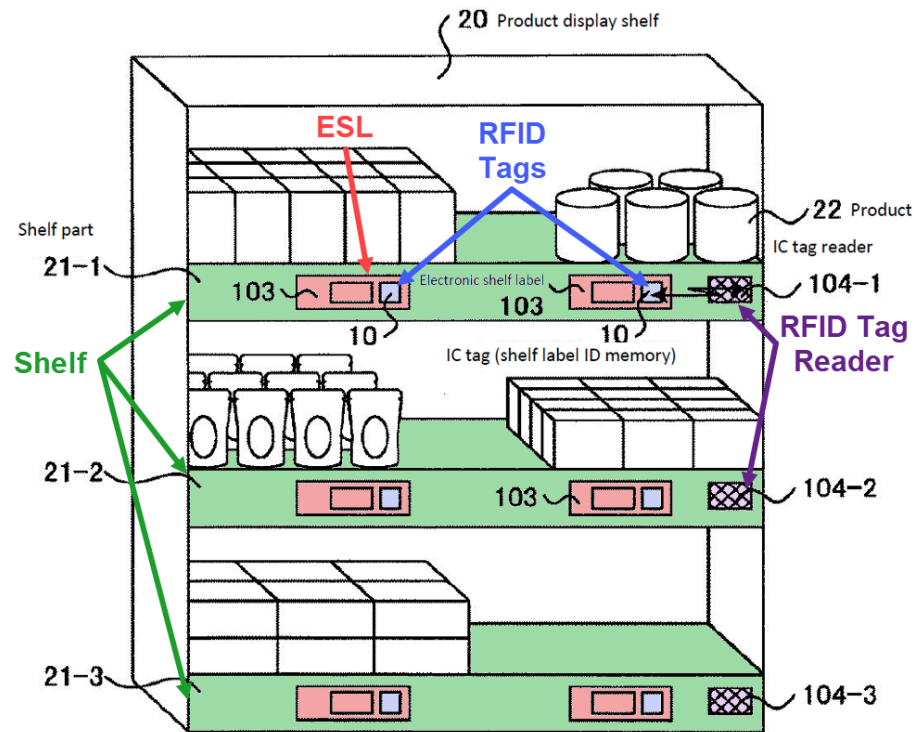
A. Fujiwara (Ex-1003)

84. Fujiwara discusses a system using a microwave transmitting and receiving unit to read an electronic shelf label with an IC (integrated circuit) tag. Ex-1003, Abstract, [0072], [0076]. Fujiwara discloses the system includes a store server with an electronic shelf label database, storing a sender ID, shelf label product

information, and shelf label location information. Ex-1003, [0060]-[0062], Fig. 3. Fujiwara expressly defines “location information” as “the shelf number of the product display shelf” and consistently describes the shelf number as the location of the electronic shelf label ID. *Id.*, [0009], [0044], [0062], [0086], [0093].

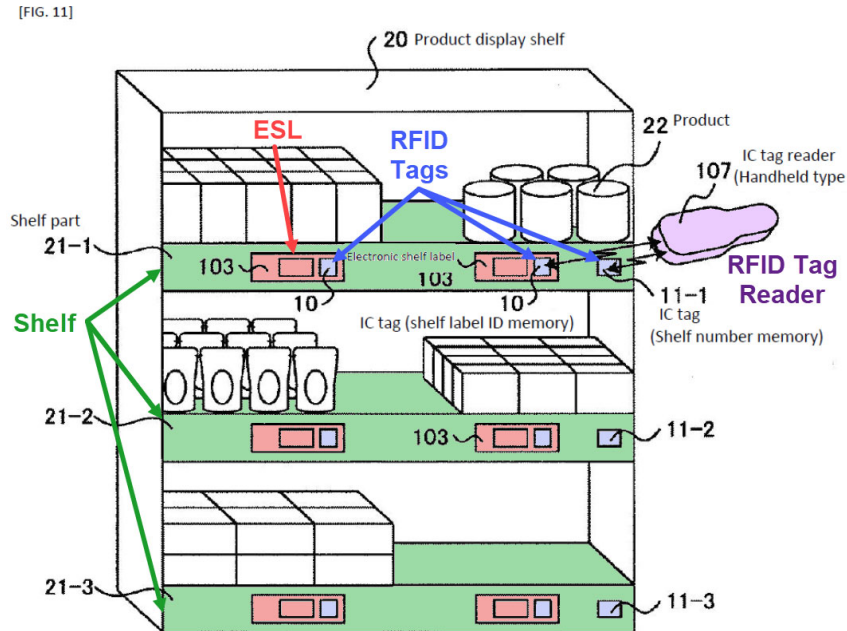
85. Fujiwara’s microwave communication system operates up to “several to several tens of centimeters.” *Id.*, [0072], [0082]. This range was consistent with microwave RFID. Fujiwara explains in its embodiments that more than one tag is read from a reader simultaneously. Ex-1003, [0082], [0090]-[0091], [0104]. I have annotated and reproduced Figure 4 of Fujiwara below. The figure illustrates an embodiment where the tag reader is on the shelf and adjacent to the tags it is reading. *Id.*, [0066]. Furthermore, a POSITA would have understood that reading multiple tags simultaneously at such a range (e.g., the entire shelf) would require longer-range communication provided by Fujiwara’s disclosed microwave RFIDs.

[FIG. 4]



Ex-1003, Fig. 4 (annotated).

86. A separate embodiment, shown in Figure 11 of Fujiwara, which I have annotated below, illustrates Fujiwara's system utilizing a handheld reader that scans multiple tags simultaneously. *Id.*, [0090]-[0091].



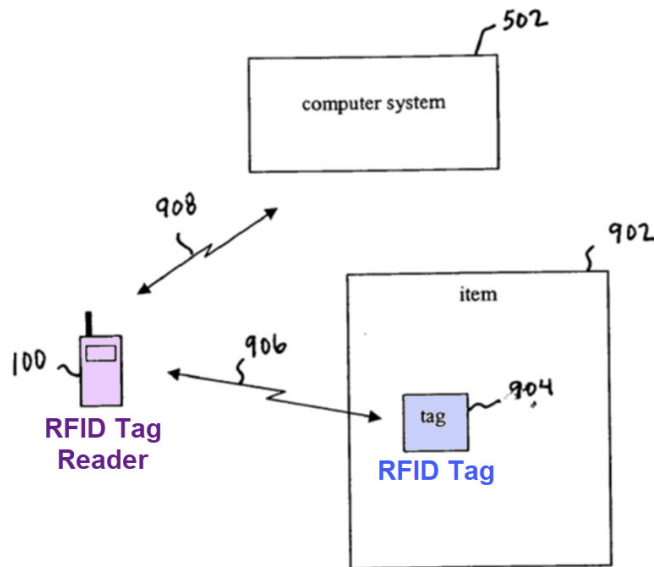
Ex-1003, Fig. 11 (annotated).

B. Bandy (Ex-1006)

87. In an embodiment, Bandy discloses a mobile device downloading a product database of a merchant. Ex-1006, [0012], [0034]. Thus, the mobile device downloads and has present on it a product database before a user interacts with any product tags. *Id.*, [0008], [0034] (“[T]he mobile communications device is used to download a product database of a merchant...when the user nears or enters the store of the merchant.”).

88. Bandy further discloses using the mobile device to read RFID tags associated with an “item of interest” to the user. *Id.*, [0034]. Figure 9 of Bandy, which I have annotated below, illustrates the mobile device (100) interacting with

an RFID tag associated with an item. *Id.*, [0054]. I note that it appears that the figure and associated disclosure mistakenly refer to the item as “902” and the tag as “904.” *See, e.g., id.*, [0054]-[0056]. In my opinion, based on Bandy’s specification, the tag should be labeled “902” and the item should be labeled “904.”

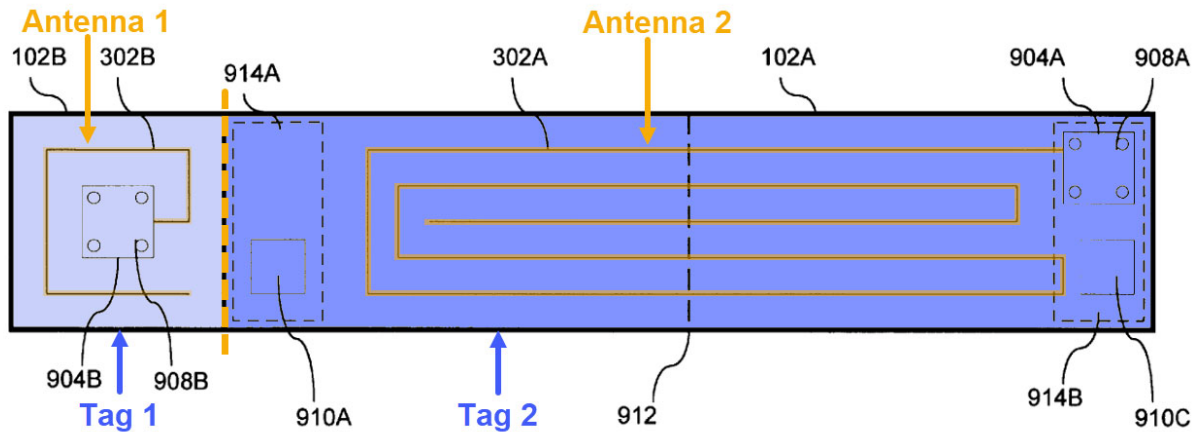


Ex-1001, Fig. 9 (annotated).

89. Bandy explains that the tags “may be attached directly to item 904, or may be located nearby and be intended to identify item 904.” *Id.*, [0054]. “Thus, tag 1600 can be affixed to items such as airline baggage, retail inventory, warehouse inventory, automobiles, compact discs (CDs), digital video discs (DVDs), video tapes, other goods, and other objects.” *Id.*, [0076]. Bandy further discloses that the tags may be read using “one or more interrogation/read protocols,” such as “binary protocols, slotted aloha protocols, and those required by the following standards:

Class 0, Class 1, and Gen 2.” *Id.*, [0055], [0077]. Bandy further incorporates by reference two other patents (U.S. Pat. No. 6,002,344 and App. Ser. No. 10/072,885 (now U.S. Pat. No. 7,075,436)) to further describe its tags and algorithms. *Id.*, ¶77.

90. U.S. Pat. No. 6,002,344 (Ex-2013 (“Bandy ’344”)) describes the manufacture of Bandy’s tags. Figure 8 of Bandy ’344 depicts a method of manufacture and Figure 9, which I have annotated below, depicts a pair of tags. Bandy ’344, 9:47-54. Bandy’s tags are printed on a flexible substrate and are thus 2D tags (very flat and flexible). Bandy ’344, 10:50-64. Bandy ’344 further discloses that the RFID tag is powered by a battery or capacitor. Bandy ’344, 4:29-37, 10:11-18. Bandy’s RFID tag operates at a frequency of 900MHz. Bandy ’344, 4:48-51, 5:38-40. As I explained above, at this frequency, Bandy’s RFID tag was either active or passive and operated in the UHF frequency range and would have had a range of several feet. In my opinion, if Bandy’s tag used NFC, attaching it to a shelf or other metal product or to a container with liquid, such as detergent, would defeat NFC because the magnetic flux would be diminished due to either a decreased cross-section or interference with the metal or liquid. Ex-2006 at R105 (explaining that metal and liquid adversely affect RFID but UHF or LF tags can operate on metal or liquids) (Kumar).

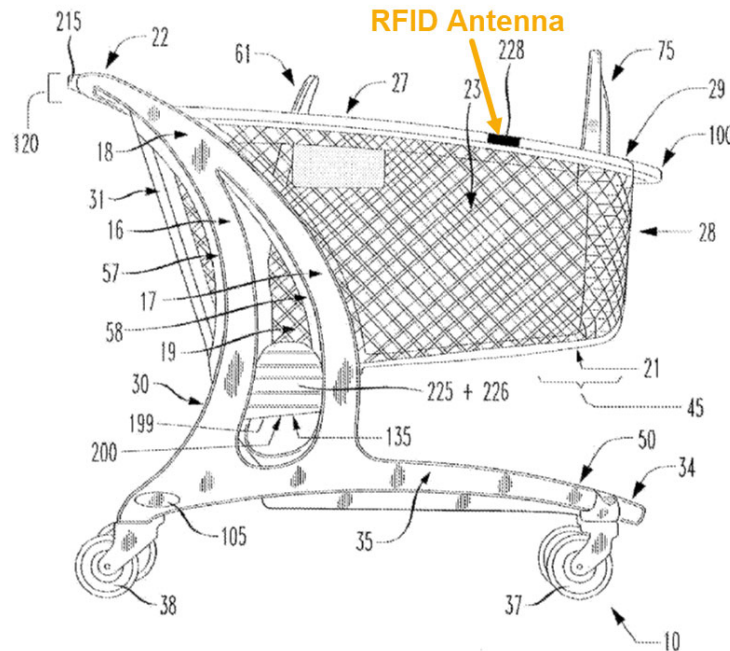


Bandy '344, Fig. 9 (annotated).

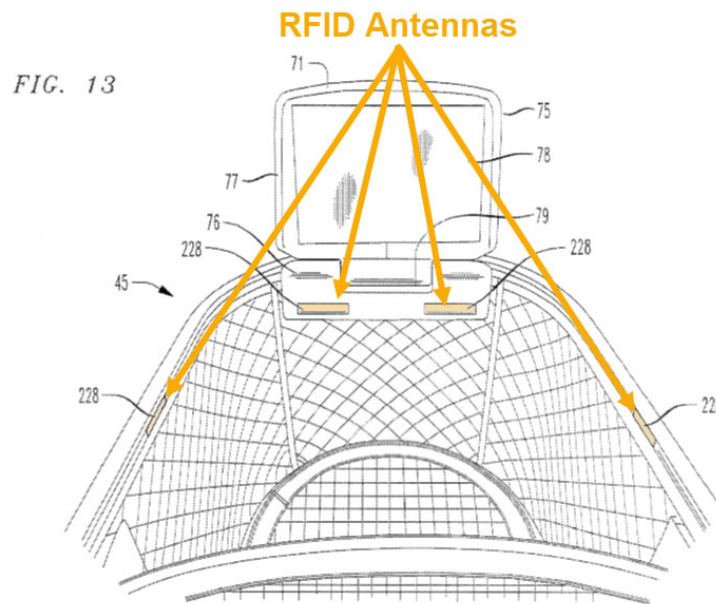
C. Fowler (Ex-1007)

91. Fowler discloses a “media enhanced shopping cart.” Ex-1007, [0001].

I have annotated Figures 1 and 13 of Fowler below, which show Fowler’s shopping cart includes RFID antennas (228) built into the shopping cart and/or into a video display attached to the shopping cart. Ex-1007, [0097], [0136]-[0138]. Fowler further discloses an RFID reader that is located in various positions on the cart, such as “on the underside of the cart” or integrated with the video display. *Id.*



Ex-1007, Fig. 1 (annotated).



Ex-1007, Fig. 13 (annotated).

92. Fowler's system is designed to read the RFID tags from a distance as the user pushes the cart. *Id.*, [0136]-[0138]. For example, Fowler discloses RFID

antennas with a particular radiation pattern that covers an area six to eight feet tall and eighteen inches wide, allowing the cart-based RFID reader to cover the complete height of a shelf and width of a product installation. *Id.*, [0137]-[0138], Figs. 20A-D. Thus, when a customer rolls Fowler's cart with the antennas down an aisle, it is designed to scan RFID tags that are placed at various heights on the shelf, even though the cart remains on the ground. In my opinion, a POSITA would have recognized that Fowler's system operates in UHF or microwave frequencies because Fowler's tag reader uses directional antennas and has a range of several feet. And that Fowler would not have worked as intended using NFC.

D. Arntzen (Ex-1005)

93. Arntzen discloses a system for displaying and updating information on electronic shelf labels ("ESL"). Ex-1005, 1:1-10, 3:22-29. Arntzen discloses communicating with electronic displays, which are ESL displays, using handheld units via near-field communication (NFC) and/or Bluetooth. *Id.*, 12:15-21. Arntzen further discloses that the displays can include a Zigbee module to communicate with a server. *Id.*, 11:16-26. Zigbee is a low-power, low-data-rate, and close proximity (i.e., personal area) wireless ad hoc network. Zigbee can also be described as a low-power wireless mesh network standard targeted at battery-powered devices in wireless control and monitoring applications.

94. It is my understanding that Petitioners use Arntzen for the limited

purpose of supplying “NFC tag modification” and “RF modification” to Fujiwara (Petition, 54-55; Ex-1009, ¶¶153-62), and “NFC tag modification” to the combination of Bandy and Fowler (Petition, 92; Ex-1009, ¶¶246-49).

VIII. CLAIMS 1-9 ARE NOT UNPATENTABLE

95. I have been asked to provide my opinion as to whether the Challenged Claims of the ’340 Patent would have been unpatentable. The discussion below provides a detailed analysis of how the prior art references identified below do not teach the limitations of the Challenged Claims of the ’340 Patent.

96. As part of my analysis, I have considered the scope and content of the prior art used by Petitioners and any differences between the alleged invention and the prior art. I describe in detail below the scope and content of the prior art, as well as any differences between the alleged invention and the prior art, with respect to certain elements for each Challenged Claims of the ’340 Patent. I further explain why a person of skill in the art would not have modified and/or combined the prior art to arrive at the claimed invention.

97. As described in detail below, the alleged invention of the Challenged Claims would not have been obvious in view of the teachings of the identified prior art references as well as the knowledge of a POSITA. Petitioner asserts the following grounds:

Ground	Petitioner’s Asserted Art
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1	Claims 1–9: Fujiwara
2	Claims 1–9: Fujiwara, Arntzen
3	Claims 1–5, 8–9: Bandy, Fowler
4	Claims 1–5, 8–9: Bandy, Fowler, Arntzen

A. Grounds 1-2: Petitioners do not show Fujiwara alone or in combination with Arntzen renders any challenged claim obvious

1. Claims 1 and 5

a) Fujiwara does not disclose or renders obvious “planogram”

98. As I mentioned above, the term “planogram” appears throughout claims 1, 2, and 5, including in both the preamble and body of the claims. *See* Section VI.A.

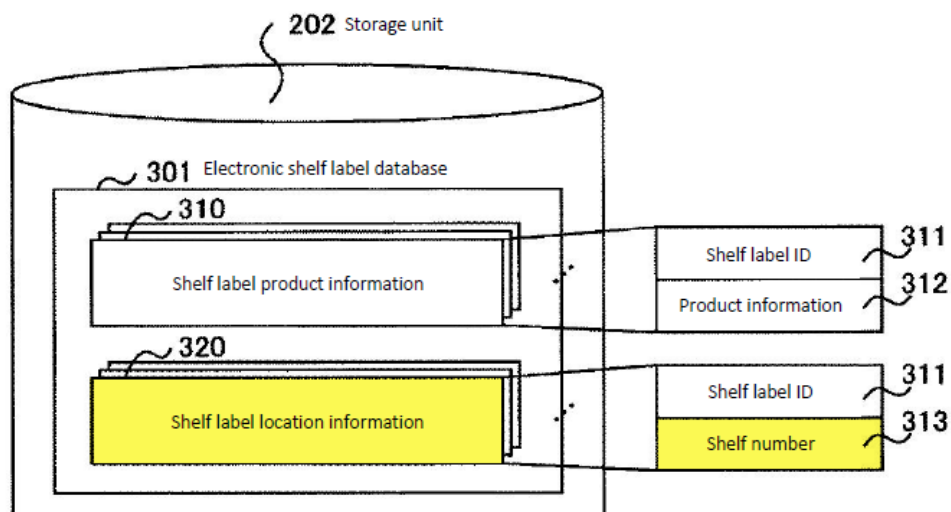
99. For purposes of my analysis, I have assumed that the preamble of claim 1 (limitation [1pre]) is limiting, which recites “a central server configured to access *a planogram* associating a plurality of unique identifiers of radio-frequency peripherals with a plurality of locations within a predetermined area, each of the plurality of locations being defined by a vertical and horizontal position within a plane perpendicular to a floor of the predetermined area, and each of the plurality of locations being associated one-to-one with a corresponding unique identifier.” Limitation [1b] then recites “determining a location of the mobile terminal within the predetermined area based on the location associated with the unique identifier of the received communication in the *planogram*, the location of the mobile terminal comprising the vertical and horizontal position of said location.” Claim 5 includes

materially the same language in limitations [5a] and [5f], and Petitioners do not offer any independent analysis for claim 5. *See* Petition, 42–44. I will therefore focus on claim 1 as illustrative, but my opinions apply equally to claim 5.

100. Further, I understand that Petitioners contend that Fujiwara’s electronic shelf database (310, 320) teaches the claimed “planogram” (Petition, 18-20), but I disagree. In my opinion, Fujiwara’s database (310, 320) does *not* constitute a planogram as the term is ordinarily understood.

101. Specifically, I have reproduced and annotated Fujiwara’s depiction of database (310, 320) below:

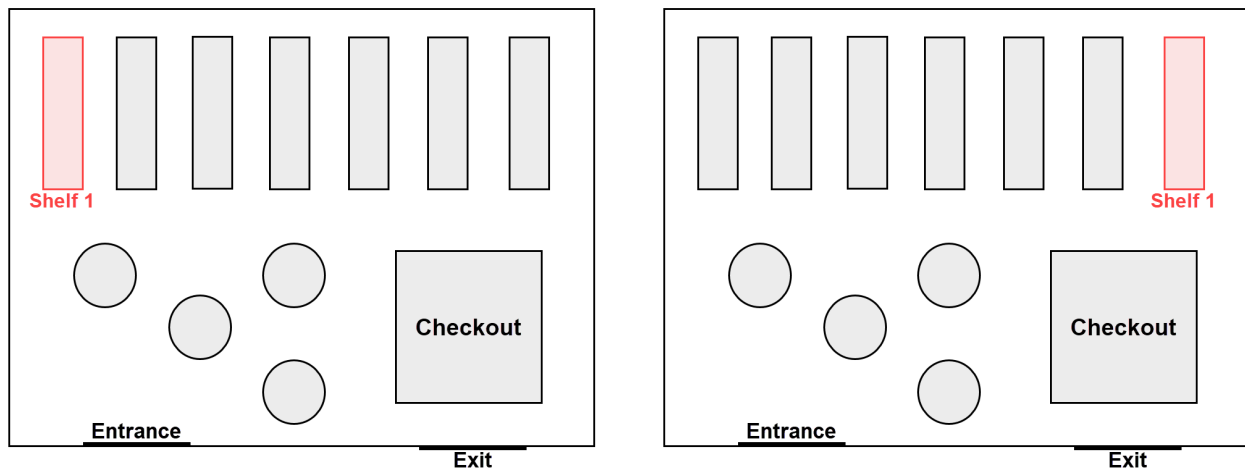
[FIG. 3]



Ex-1003, Fig. 3 (annotated). As shown and described in Fujiwara’s specification, Fujiwara’s database has two components: (1) “shelf label product information” (310) that stores an association between “shelf label ID” (e.g., a serial-like number for the ESL) and “product information”; and (2) “shelf label location information” (320)

that stores an association between “shelf label IDs” and “shelf numbers.” Ex-1003, [0044], [0062], [0086], [0090], [0092], Figs. 3, 10, 12; Ex-1009, ¶71. Because the “shelf label ID” appears in both components (310, 320), the shelf number associated with each product can be determined (e.g., by querying the “shelf label ID”), but that is all the information Fujiwara provides.

102. In my opinion, providing a database that provides only the shelf numbers of products linked through a “shelf label ID” cannot constitute a “planogram” for a few reasons. To start, having just a shelf number does not provide any information as to where products are located in the retail area. A shelf number—and thus a product—may sit anywhere in the retail area because Fujiwara does not provide any positional information about the shelves themselves. I have created an example image showing how shelf “Shelf 1” can be anywhere in the retail area:



Relatedly, Fujiwara’s shelf numbers do not even say how different shelves relate to one another. For instance, would a “shelf 1” and “shelf 2” be located on the same

shelf segment, but at different heights? Or are they in different shelf segments in different parts of the retail store? Or, even if they are in the same shelf segment, how high does each shelf sit (because one consideration provided by planograms is the ability to plan the placement of high-interest products at eye level or within arm's length)? Because Fujiwara discloses only arbitrary shelf numbers without specifying a location of those shelves in the retail store or relative to one another that would typically be expected of a planogram, in my opinion, as POSITA would not understand Fujiwara's database (310) to constitute a planogram.

103. Moreover, Fujiwara's database (310, 320) does not provide any information regarding where a given product is on its assigned shelf, or the extent of shelf space each product is provided, which are also fundamental elements of a planogram. *See* Section VI.A. Instead, Fujiwara discloses that the database will provide user the shelf number, the user locates that shelf in the retail area, and then a light indicator *on the shelf label* indicates where along the shelf the product sits. *See, e.g.,* Ex-1003, [0006], [0046]. Following this process, the location of a product can only be found in the retail store itself, not in the database, and thus retailers cannot use the database to plan out and track the particular arrangement of products on shelves, such as how much shelf space each product is given, which is information planograms are generally understood to provide. *See* Section VI.A.

104. Although I understand that Petitioners and Dr. Tentzeris contend the

Fujiwara's database (310, 320) is a planogram, I have not seen any evidence or support for this position. Instead, Dr. Tentzeris appears to just call Fujiwara's shelf number a "location" and concludes that is sufficient to constitute a planogram. *See* Ex-1009, ¶¶70-74. But, in my opinion, Dr. Tentzeris does not explain why the plain meaning of "planogram" would be understood by a POSITA to encompass a database that provides only shelf numbers of products, or that the inventors of the '340 Patent somehow redefined the term different from its ordinary understanding.

105. For these reasons, I do not consider Fujiwara as disclosing a planogram as it is ordinarily understood.

106. Each of the remaining challenged claims depend from claims 1 or 5. In addition, Petitioners rely on Arntzen in Ground 2 to address only the RF and NFC features, and that analysis does not address a "planogram." Petition, 54-56. For these reasons, I disagree that Fujiwara alone, or even when combined with Arntzen, discloses the claimed "planogram."

b) Fujiwara does not disclose or render obvious the claimed "horizontal position" or "one-to-one" association

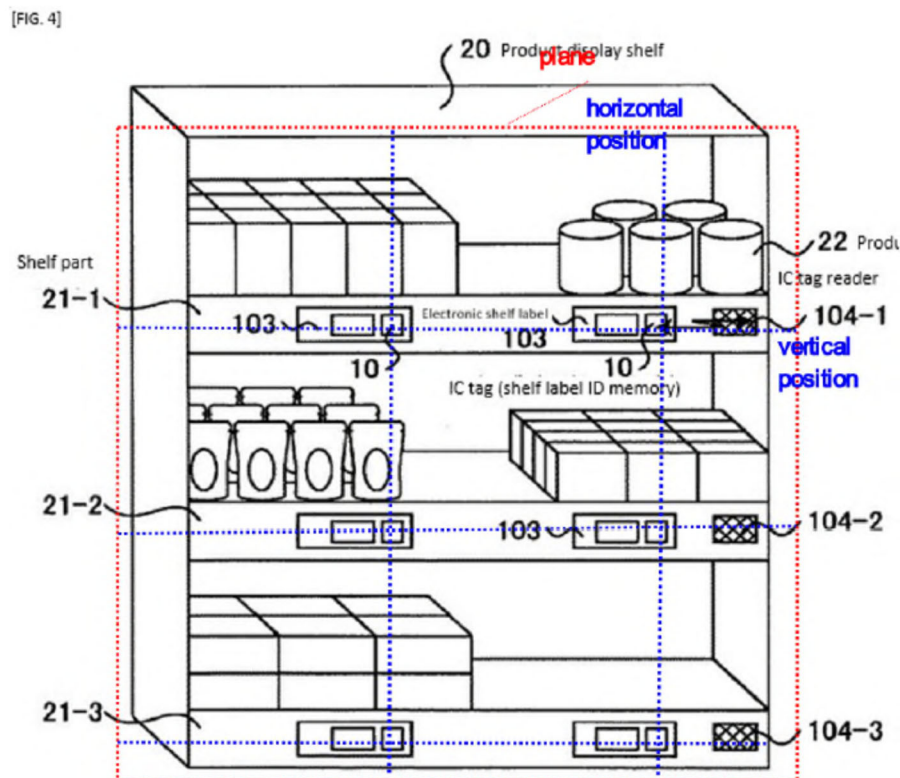
107. Limitation [1pre] recites "a planogram associating a plurality of unique identifiers of radio-frequency peripherals with a plurality of locations within a predetermined area, *each of the plurality of locations being defined by a vertical and horizontal position* within a plane perpendicular to a floor of the predetermined

area, and each of *the plurality of locations being associated one-to-one with a corresponding unique identifier.*” Limitation [1b] similarly recites “*the location of the mobile terminal comprising the vertical and horizontal position of said location.*” To summarize, then, the “location” associated with each “unique identifier” must not only include *a vertical and horizontal position*, but also provide one-to-one correspondence between the two (e.g., each unique identifier is associated with only *one* set of vertical and horizontal positions, and each set of vertical and horizontal positions is associated with only *one* unique identifier). Claim 5 includes materially similar limitations, Petitioners or Dr. Tentzeris to offer any independent arguments for claim 5. I will therefore focus on claim 1 as illustrative, but my opinions apply equally to claim 5.

108. Even assuming Fujiwara’s electronic shelf database (310) teaches a “planogram” (which, as I explained above, it does not), in my opinion, Fujiwara’s electronic shelf database (310) does not associate a location with a horizontal position (as required by [1pre]) nor have a central server determine a location that includes the horizontal position as part of the label location (as required by [1b]). Fujiwara also does not disclose a one-to-one association between the label’s unique identifier and the location (e.g., the vertical and horizontal position).

(1) Fujiwara Only Tracks Shelf Numbers, and the Depiction in Figure 4 Does Not Represent the Contents of Fujiwara’s Database

109. Petitioners appear to argue that Fujiwara discloses the claimed “horizontal position” because Fujiwara discloses “that each of the plurality of locations is defined by a vertical position (represented by shelf number 313) and a horizontal position (the horizontal position of the electronic shelf label along the horizontal shelf part 21, **as shown in FIG. 4**).” Petition, 21; Ex-1003, [0066]. Petitioners then reproduce Figure 4 (with annotations in color added by Petitioners, below) including the identified “horizontal position.” Petition, 22.



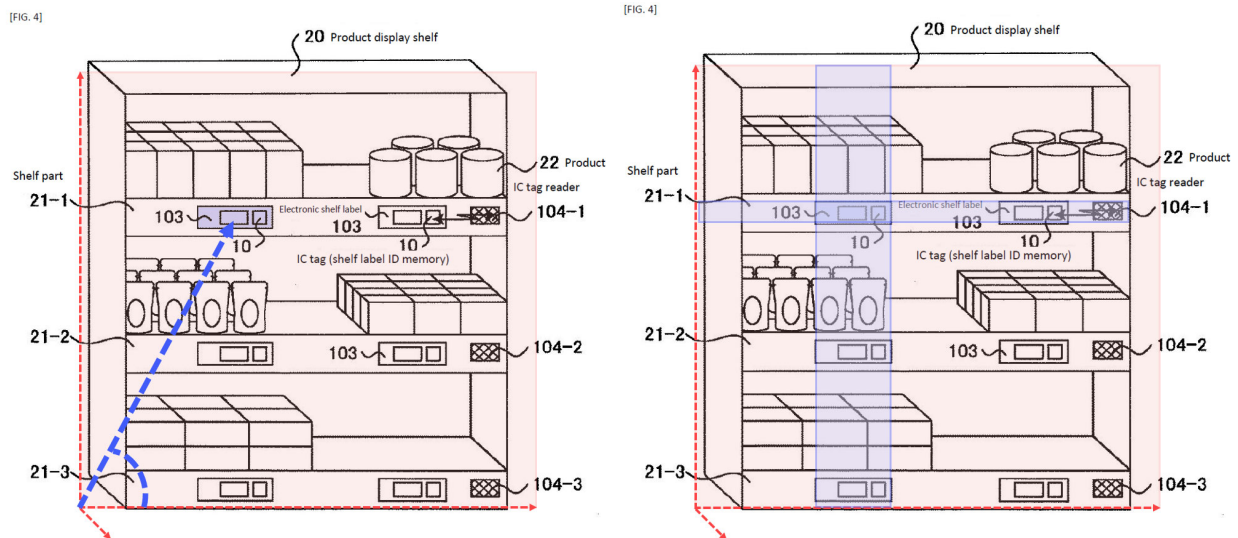
Ex-1003, Fig. 4 (annotated by Petitioners)

I disagree that Fujiwara's Figure 4 demonstrates a disclosure of "horizontal positions," as claimed, and Petitioners' annotations cannot cure that deficiency.

110. To start, Fujiwara's Figure 4 does not represent what information is included in Fujiwara's database (310) (which Petitioners call the claimed "planogram"), but these claim terms are directed to the contents of *the planogram*. Ex-1001, cls. 1, 5 ("a central server configured to access a planogram associating a plurality of unique identifiers ... with a plurality of locations"). Instead, Fujiwara discloses that Figure 4 is "a diagram depicting the appearance configuration of the electronic shelf label 103 and IC tag reader 104." Ex-1003, [0066], [0113]. In other words, a POSITA would understand Figure 4 to be a depiction of an actual shelf consistent with Fujiwara's disclosure, not the contents of Fujiwara's database (310), which is instead shown in Figure 3. Fujiwara does not indicate that the contents of that database (310) contain all of the details (including positions) shown in Figure 4, which is also why I do not consider the "planogram" to be disclosed, as I discussed previously. *See* Section VIII.A.1.a). In my opinion, therefore, a POSITA would not consider Figure 4 as addressing the contents of Fujiwara's database (310).

111. Based on my review of the Board's Institution Decision, I understand the Board was persuaded by the positional information provided in Fujiwara's Figure 4, *see, e.g.*, Institution Decision, 27-28 ("As Figure 4 of Fujiwara illustrates, the tags are positioned at locations on shelves in a two-dimensional plane

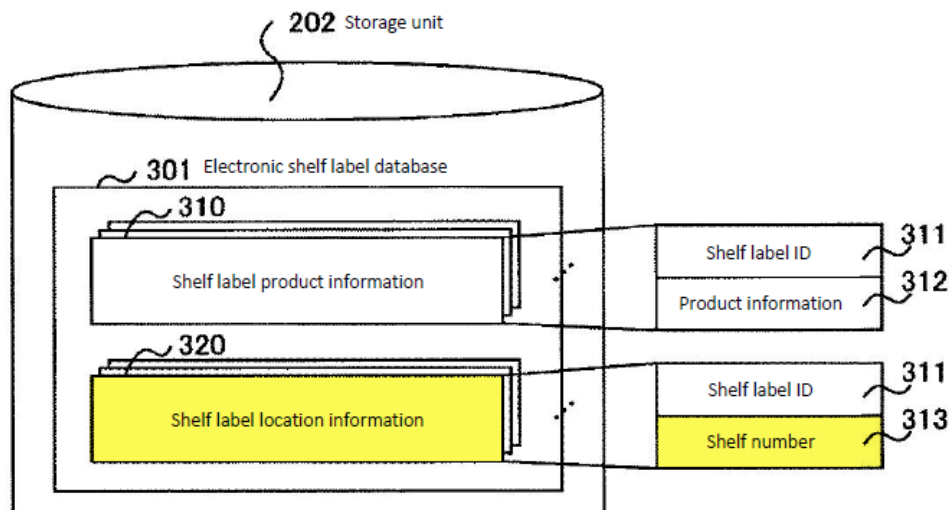
perpendicular to the floor. We are persuaded that an ordinary skilled artisan would have understood that, because defining a location in a two-dimensional plane requires specifying at least two coordinates, e.g., a Y coordinate (vertical position) and an X coordinate (horizontal position), listing the horizontal and vertical position of each of Fujiwara's uniquely numbered tags in a database would define the location of each such tag."). But because it is my opinion that a POSITA would not consider Figure 4 to speak to the contents of Fujiwara's database, I respectfully disagree with the Board's analysis. Moreover, there are other ways to define a position in a plane, and thus an X-Y coordinate is not "required," as the Board concluded, such as using a vector of R length and θ angle from a reference to define a point (polar coordinates), or using rows, columns, or other shapes to define a wider area. I have reproduced Fujiwara's Figure 4 below and illustrated these methods using polar coordinates (left) and rows/columns (right):



Ex-1003, Fig. 4 (annotated).

112. When properly focusing on Fujiwara’s disclosure of the database (310), as I mentioned previously with respect to the claimed “planogram,” neither Petitioners nor Dr. Tentzeris appear to dispute that Fujiwara discloses a database (310) that provides “location information” that only associates a “shelf label ID” with a “shelf number.” *See, e.g.*, Ex-1003, [0044], [0062], [0086], [0090], [0092], Figs. 10, 12; Ex-1009, ¶71 (Dr. Tentzeris recognizing that Fujiwara discloses only “shelf label ID 311, and shelf number, 313, and the like,” while never explaining what “and the like” includes).

[FIG. 3]



Ex-1003. Fig. 3 (annotated).

113. Consistent with Fujiwara’s disclosure and depiction in Figure 3, in my opinion, a POSITA would expect that Fujiwara’s database (310) would include “location information” that looks like the following example:

Shelf Label ID	Shelf Number
0001	17
0002	5
0003	12
0004	5

Alternatively, even assuming a POSITA would implement Fujiwara's disclosure by using the shelf label ID and shelf numbers consistent with reference numbers provided in Figure 4, which may provide slightly *more* location information in that they identify all segments of a shelf (e.g., 21) based on relative height (e.g., -1, -2, -3), that would still produce a database like the following:

Shelf Label ID	Shelf Number
103-1	21-1
103-2	21-1
103-3	21-2
103-4	21-3

114. Although I do not consider either example based on Fujiwara's disclosure to provide any vertical position because identifying different shelves (e.g.,

21-1, 21-2, 21-3) in a single shelf segment by number does not provide any **vertical position** (unless it can be assumed that every shelf is at a pre-defined height, e.g., all N-1 shelves are at 72 inches, all N-2 shelves are at 48 inches, etc.), under no circumstances would a POSITA consider Fujiwara to disclose any **horizontal position** in the database (310), as required by the claims. All Fujiwara provides is a shelf number. And that is because Fujiwara just envisioned a system that would identify the correct shelf, and then having the target label emit a light to locate the desired product along the shelf. *See, e.g.,* Ex-1003, [0006] (describing a system that “provides a function for locating a product in a store and presenting the location of the product, **by the use of an electronic shelf label equipped with an IC tag and a light emitting means**, as well as the use of a mobile information terminal.”). Knowing the shelf number is precise enough for Fujiwara to provide product information because the shelf number corresponds to a shelf label ID (Ex-1003, [0044]); nothing more is needed.

115. And because Fujiwara does not disclose a database (310) that stores any horizontal position information, there would be no horizontal position information available to determine the location of the mobile terminal as required by limitation [1b].

116. Moreover, as shown in the above examples, a POSITA would not consider Fujiwara as disclosing the claimed “one-to-one” association between

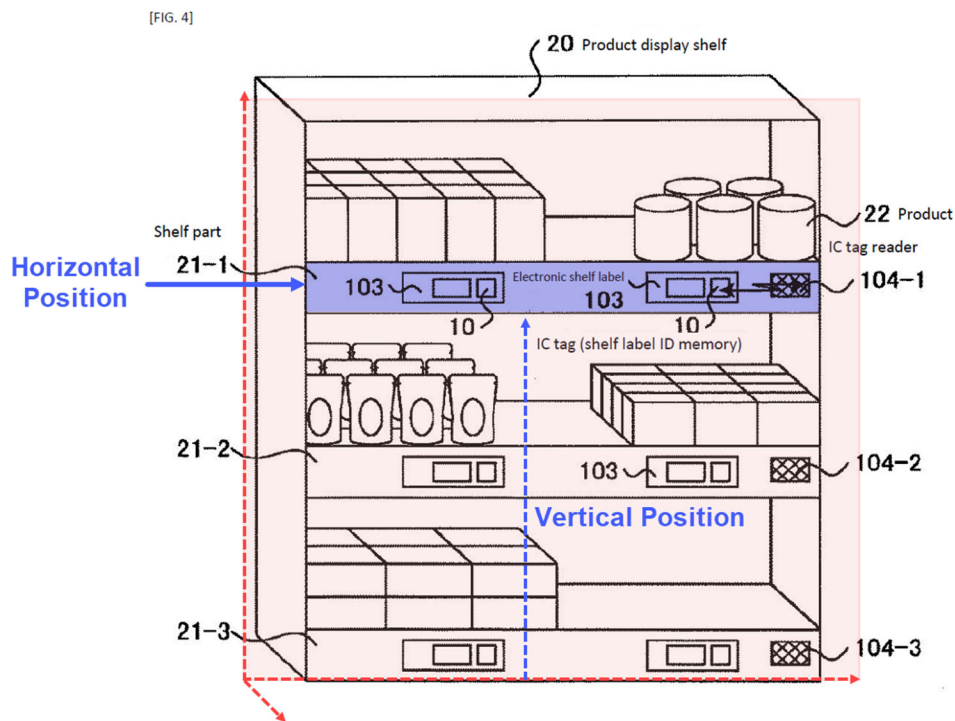
Fujiwara’s “shelf label ID” and “shelf number.” A POSITA would understand that this one-to-one correspondence is critical to determine a precise location of a mobile terminal, as called for by the claims, because no two labels could have the exact same location information (because no two labels could occupy the exact same vertical and horizontal position). Instead, as Fujiwara shows in Figure 4, multiple shelf labels can be placed on the same shelf, and thus would have the same entry for “shelf number” in the database (310). In my example representation of Fujiwara’s database above, for instance, two labels (103-1 and 103-2) would have an associated shelf number (21-1), which is a two-to-one, not one-to-one association. If more labels were added to the same shelf—as would be expected in a real store—that would produce higher degree of association (e.g., twenty-to-one or more) between a unique identifier and its associated position.

(2) Petitioners’ Alternative Theories Fail to Show That Fujiwara Discloses Associating an Electronic Shelf Label with a Horizontal Position

117. Based on my review of the Petition, I also understand that Petitioners offer several other theories as to how Fujiwara could disclose a horizontal position, but I disagree.

118. For example, Petitioners appear to take the position that the entire shelf—which is the identified vertical position—can be the horizontal position. *See* Petition, 32–34 (showing annotated Figure 11). In my opinion, this would render the

“horizontal position” limitations of the challenged claims meaningless because an entire shelf is not a position; it is akin to a line comprised of countless “positions.” It would also seem this position would render meaningless the required “one-to-one” association of claims 1 and 5 because—if the whole shelf were considered a single “horizontal position”—that exact same horizontal position would encompass multiple labels (and thereby multiple “unique identifiers,” mapped to Fujiwara’s “shelf label IDs”). I have provided an annotated illustration below:



Ex-1003, Fig. 11 (annotated).

119. Petitioners also contend that “a POSITA, familiar with the typical layout of a retail store, would find it obvious that multiple product display shelves 20 can be placed side by side within an aisle, and thus the horizontal position of a

product display shelf 20 within the aisle is the claimed horizontal position.” Petition, 22 (citing Ex-1009, ¶76). I disagree.

120. First, the same problem with calling an entire shelf a “horizontal position” remains when joining multiple shelves together: Fujiwara would still fail to teach the “one-to-one” correspondence because each shelf segment in a line can have multiple labels.

121. Second, Petitioner do not identify any support for this assertion, other than through the testimony of Dr. Tentzeris, who concludes only that “Fujiwara discloses a plurality of product display shelves in Ex. 1003, [0097].” Ex-1009, ¶76. But it does not follow that by merely disclosing a plurality of product display shelves, a POSITA would consider each shelf segment placed side-by-side to be its own horizontal position. In fact, the paragraph Dr. Tentzeris cites simply discusses dividing the entire sales floor into zones, each having multiple product display shelves. *See* Ex-1003, [0097]. But Fujiwara never discloses that each shelf segment (whether in zones or not) can be positioned side-by-side, let alone using that configuration to delineate different “horizontal positions.”

122. In sum, Petitioners never show Fujiwara discloses or renders obvious the “horizontal position” or “one-to-one” association recited in [1pre], [1b], [5a], and [5f]. Moreover, I do not understand Petitioners to rely on Arntzen in Ground 2 to address these limitations, but only for its teaching of RF and NFC. Petition, 54-

56. For these reasons, it is my opinion that Fujiwara does not disclose tracking a “horizontal position” in database (310), and therefore does not meet the claims, and neither Petitioners nor Dr. Tentzeris identify any reason why a POSITA would be motivated to modify Fujiwara to arrive at the claims regardless.

**c) Fujiwara does not disclose or render obvious
“activated”**

123. Limitation [1a] recites “wherein the radio-frequency peripheral...is configured to be *activated* by the mobile terminal...within a communication range...wherein the communication range is less than twenty centimeters.” In my opinion, based on the ’340 Patent’s usage of the terms “activated” and “activating,” neither Fujiwara alone nor Fujiwara in combination with Arntzen teach a radio-frequency peripheral that is “activated.” Claim 5 includes materially the same language in limitation [5c], and Petitioners do not offer any independent analysis for claim 5. *See* Petition, 42-43. The remaining challenged claims depend from either claim 1 or 5.

124. For the reasons provided below, in my opinion, I do not consider Fujiwara or Fujiwara combined with Arntzen to disclose or render obvious these limitations.

(1) Fujiwara

125. Based on my review of the Petition, it appears that Petitioners rely on Fujiwara’s steps S1402-S1405 (Ex-1003, [0104], Fig. 14) to meet the claimed

“activated” limitation. Specifically, Petitioners contend that:

[a] POSITA would recognize that the sequence of the IC tag reader 506 transmitting *a resonant call-up signal* to the IC tag 10 and then the IC tag 10 receiving the call-up signal and transmitting a response signal is a sequence *whereby the radio-frequency peripheral is activated* by the mobile terminal.

Petition, 26.

I disagree that Fujiwara activates the IC tag (10), let alone by using a “resonant call-up signal.”

126. First, Fujiwara explains that its IC tags (10) are *active* tags, not passive ones. Specifically, when describing IC tag (10), Fujiwara explains that “electronic shelf label 103 [which houses tag 10] has a solar cell or thin battery (not depicted) as a drive source.” Ex-1003, [0071]; *see also id.*, [0067]. In my opinion, because Fujiwara expressly discloses providing a power source to the label (103) that houses the tag (10), a POSITA would have understood that the IC tag (10) would draw power from the same power source as the label (103), and would not need to be provided power from a tag reader (104 or 107).

127. Second, although Fujiwara does not explain exactly what a “resonant call-up signal” is, in my opinion, a POSITA would understand the term to refer only to establishing a communication channel between the IC tag (10) and tag reader (104 or 107), for instance, using a dipole resonant circuit. Specifically, Fujiwara discloses that the IC tag reader “*transmits* a call-up signal resonant with respect to the ESL

103 (with integrated IC tag 10)” and then reads the response signal from the tag. Ex-1003, [0072], [0082]. Fujiwara also discloses that after receiving the resonant call-up signal, tag 10 “*transmits* a response signal.” *Id.* [0085], [0092], [0104].

128. A POSITA would have also appreciated that the terms “call-up” or “call out” were used to refer to radio-communication-messaging protocols to establish a communication channel, without any reference to “activating” or “powering” a device. *See, e.g.*, Ex-2020, [0003]-[0005] (“In a radio communication system using the protocol groups, a group call is provided in which a call within a group consisting of multiple radio communication terminals is established when one of the radio communication terminals ... *calls up* the other radio communication terminals.... [A] radio communication terminal which has failed to receive *a call-up signal* can receive the notification information.”); Ex-2021, Abstract (“The outgoing terminal 10a includes ... a call connection establishment unit 12 that transmits *call out* signals for calling out to the incoming terminal 10b.”). Resonant circuits are also used to communicate information between RFID devices. *See, e.g.*, Ex-2022, 7:26-41 (noting how resonant RFID systems can be active or passive). A POSITA, therefore, would have recognized based on the totality of Fujiwara’s disclosure that, because label (103)—which includes IC tag (10)—already has a dedicated power source, and a “resonant call-up” signal would be understood to merely refer to the signal to establish a communication channel between the reader and tag, this “call-up signal”

would not be a means to activate or power the IC tag (10).

129. Based on my review of Dr. Tentzeris’s declaration, he does not appear to offer any other understanding of this term. Instead, he just repeats the same arguments that appear in the Petition without any additional elaboration. Ex-1009, ¶85. Without any additional explanation, I cannot agree with Dr. Tentzeris’s that Fujiwara’s “resonant call-up” signal would be understood to refer to “activating” or “powering” the IC tag (10).

(2) Arntzen

130. Petitioners also combine Fujiwara with Arntzen in Ground 2 to replace Fujiwara’s general IC tag (10) with NFC. Petition, 54-55. As a general matter, and as I explain in more detail below, a POSITA would not have modified Fujiwara to use NFC in the first place. *See* Section VIII.A.1.e).

131. But even if a POSITA would have modified Fujiwara to incorporate *Arntzen’s* NFC, that still would not have resulted in a tag that is “activated” or “powered” by the reader because, just like Fujiwara, Arntzen discloses that its tag is also active—not passive—and powered by its own power source. Specifically, Arntzen discloses that the labels are powered by either a battery or an electric rail in the shelf. Ex-1005, 12:15-18 (noting how “electronic displays 12 shall also be able to communicate externally with other handheld units, such as a mobile phone 20”), 9:17-18 (“The electronic display can be a battery free unit and be connected to a

current conducting fastening rail”), 13:31-14:10 (“To provide power to the displays 12 they can be placed in a current carrying rail 50 which is arranged to the shelf edge.”). A POSITA would have thus understood that Arntzen’s electronic displays were active devices and not powered through NFC. Therefore, in my opinion, even if Fujiwara were modified in view of Arntzen, the end result still would have been an *active* NFC label that would not require being “activated” or “powered” by the reader. I do not understand Petitioners or Dr. Tentzeris as offering any explanation for why Fujiwara and Arntzen to be further modified to use a passive tag that would require being “activated” or “powered” by the reader.

132. Accordingly, Fujiwara, whether or not in combination with Arntzen, fails to disclose that the radio-frequency peripheral “is configured to be activated by the mobile terminal.” *Id.*

d) Fujiwara (with or without Arntzen) does not disclose or render obvious the recited “communication range is less than twenty centimeters”

133. Claim limitation [1a] requires the mobile terminal to “activate” (which, in my opinion, means “power”) the radio-frequency peripheral when the communication range of the radio-frequency peripheral is no more than 20 centimeters. *See, e.g.,* Ex-1001, cl. 1 (claiming a “radio-frequency peripheral ... configured to be activated by the mobile terminal when the radio-frequency communication peripheral is within a communication range ... [of] less than twenty

centimeters.”). Claim 5 includes materially the same language in limitation [5c], and Petitioners do not offer any independent analysis for claim 5. *See* Petition, 42-43. The remaining challenged claims depend from either claim 1 or 5.

134. For the reasons provided below, in my opinion, I do not consider Fujiwara or Fujiwara combined with Arntzen to disclose or render obvious these limitations.

(1) Fujiwara

135. Even if Fujiwara’s tags could be considered to be “activated” by its tag readers, in my opinion, Fujiwara does not disclose that the “communication range is *less than twenty centimeters*.” Based on my reading of the claims and the specification of the ’340 Patent, a POSITA would have understood that any communication range twenty centimeters or more, would not provide the needed precision of location determination for the mobile terminal.

136. Based on my review of the Petition, Petitioners appear to contend that Fujiwara’s disclosure of the tag reader reading the “response signal from the IC tags 10, 11 at a distance of several to several tens of centimeters” as disclosing this limitation. Petition, 26.

137. I understand that Petitioners rely upon a legal concept concerning the obviousness of ranges, which looks to whether a prior-art reference discloses a parameter with a specified range, and if the claimed invention discloses a narrower

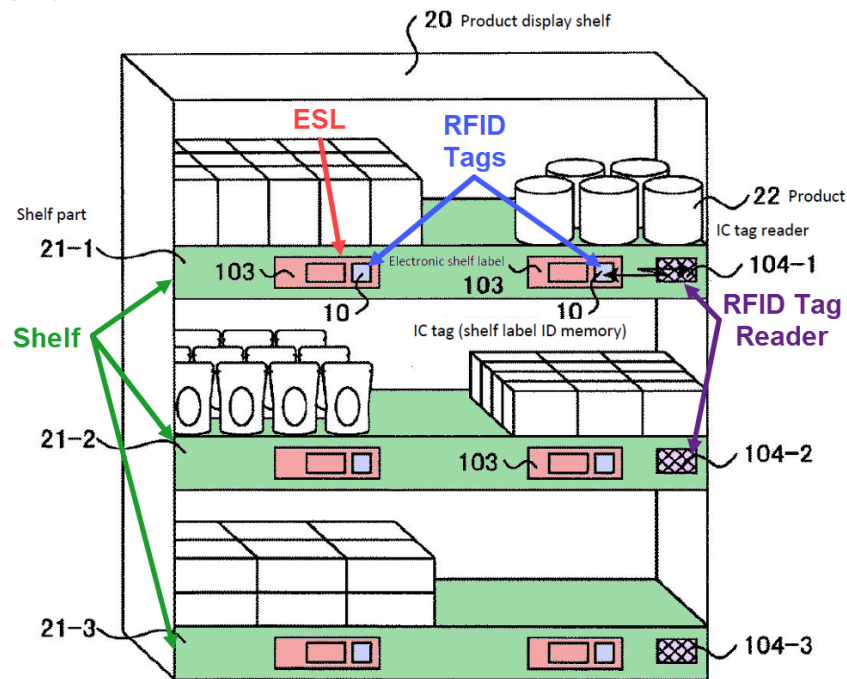
subset within that range, there is a presumption the claimed parameter is obvious. *Id.*, 27. I understand, however, that this presumption can be overcome if it can be demonstrated that the claimed range is critical to the invention because it provides a new or unexpected result, and/or if the prior art teaches away from the claimed range.

138. As I explained previously, in my opinion, the claimed range is critical to the inventions of the '340 Patent. *See* Section V.A. The '340 Patent explains that a communication range of less than 20cm “firstly ensures matching between the location of the electronic label 3 and the mobile terminal 1 and secondly allows interference to be limited between electronic labels when they are positioned close to one another.” Ex-1001, 6:54-58. “[T]he uniqueness of the label identifier and of the location associated with each electronic label 3 allows unambiguous determination of the location of the electronic label 3 from its identifier, and as a result it is possible to determine the location of the mobile terminal 1.” *Id.*, 6:43-47. Moreover, providing such “a short range requires deliberate action by the user ... to set up communication,” that “cannot easily be diverted from its primary vocation” (e.g., abused by intruders). *Id.*, 6:59-65. Based on these descriptions, a POSITA would have understood the claimed less than 20cm range is critical to the claimed invention, otherwise these disclosed benefits could not be realized.

139. Fujiwara, to the contrary, requires distances of “several to several tens of centimeters” with the intention of capturing distances *greater* than 20cm because

Fujiwara's IC tags (10) and reader serve a fundamentally different function. Ex-1003, ¶¶72, 82. Specifically, Fujiwara discloses a desire to read IC tags (10) over greater distances, in-part so that more than one tag can be read at a time. Ex-1003, [0066], [0082], [0090], [0103]-[0104], Figs., 4 (annotated to show comm with second label) 11, 12, 14. In the embodiment of Figure 4, for instance, Fujiwara explains that "IC tag readers 104-1, 104-2, ... are provided in a state where the shelf label ID stored in the IC tag 10 integrated in one or more electronic shelf labels 103 on the same shelf part 21 ... can be *read collectively* without contact at each shelf part 21-1, 21-2, ... of the product display shelf." Ex-1003 ¶66. A POSITA would understand based on Fujiwara's Figure 4 that readers 104 are built into (or at least affixed to) the shelf itself and must therefore be capable of reading IC tags 10 across the entire shelf segment even at great distances.

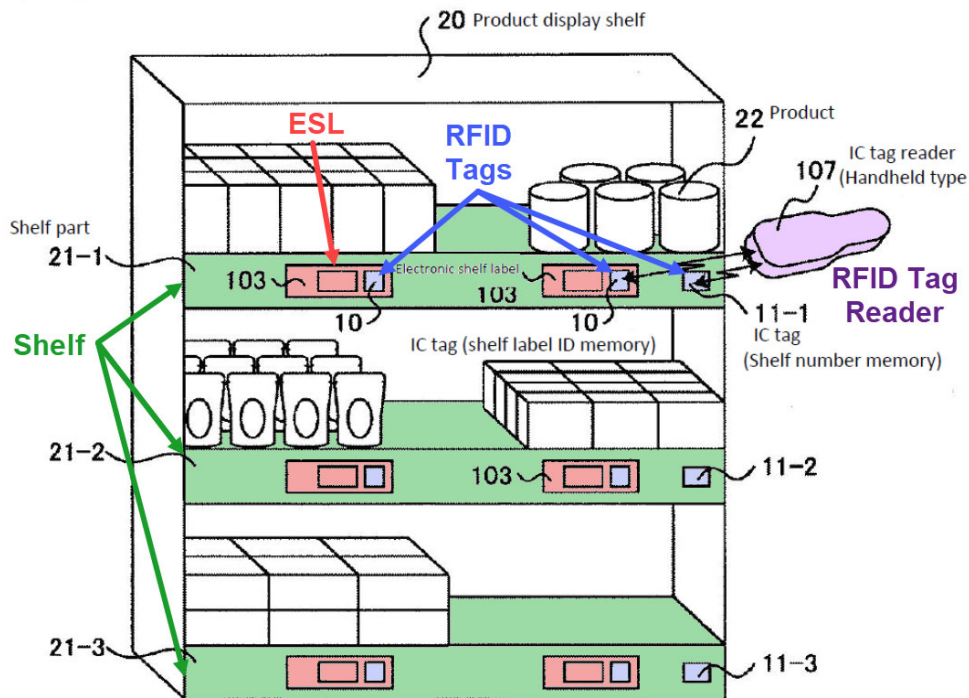
[FIG. 4]



Ex-1003, Fig. 4 (annotated)

140. Moreover, for the embodiment of Figure 11, Fujiwara explains how a user can “manually hold[] the hand-held type IC tag reader 107 *over each shelf part* 21 (IC *tags* 10, 11) of the product display shelf 20 when confirming the location of the product (step S1201).” Ex-1003, [0091]. Thus, a POSITA would understand that Fujiwara envisions reading multiple IC tags 10, 11 with a handheld reader device for ease of execution, without having to bring the handheld reader into close proximity with each and every tag.

[FIG. 11]



Ex-1003, Fig. 11 (annotated).

141. Furthermore, although Fujiwara's system may be *capable* of reading an IC tag at distances less than 20cm, it must also have the ability—and use concordant RFID technology that enables (e.g., microwave RFID)—to read IC tags over distances greater than 20 cm. And as I explained previously, the hardware involved to implement these different distance ranges (e.g., NFC for less than 20cm; microwave RFID for up to 3 feet) are completely different. *See* Section V.C.

142. In order to preserve Fujiwara's multiple-tag-reading functionality while limiting reading ranges to 20cm or less, Fujiwara's labels would need to be spaced extremely close together. But if Fujiwara's labels utilized NFC technology in

particular to achieve these short distances, as the claims require and as Petitioners advocate, then placing multiple tags at less than 20cm apart would cause substantial interference between adjacent tags, preventing multiple tags from being read together. Ex-2006, R105. While specifications, such as ISO 14443, allow for anticollision protocols, this is not a preferred implementation and would add unnecessary overhead to the Fujiwara design. Moreover, Petitioners never explain how or why a POSITA would give up Fujiwara's functionality in favor of implementing the NFC hardware and protocols with its added complexity.

143. For these reasons, because the technical implementations (e.g., hardware and communication protocols) are different between Fujiwara and the claims, and those implementations each achieve different communication distances (NFC for short distances, consistent with the '340 Patent; and what a POSITA would understand to be microwave RFID for longer distances, consistent with Fujiwara), a POSITA would not have found restricting the reading distance to 20cm or less to be obvious, even though the prior art taught technologies capable of doing so, because Fujiwara's technologies also enabled reading distances much greater than 20cm.

(2) Arntzen

144. Based on my review of the Petition, I understand Petitioners contend in Ground 2 that a POSITA would have been motivated to modify Fujiwara in view of Arntzen to incorporate NFC with its associated range of less than 20cm. Petition,

54-55. However, for the reasons I discussed below, in my opinion, a POSITA would not have been motivated to incorporate NFC into Fujiwara's system. *See* Section VIII.A.1.e). Without NFC, Fujiwara's system would not have the claimed communication range of 20cm or less because Fujiwara's system was intended to be capable of communication ranges in excess of 20cm.

e) Fujiwara (with or without Arntzen) does not disclose or render obvious “an antenna and an electronic chip configured for near-field communication”

145. Limitation [1a] recites that “the radio-frequency peripheral includes an antenna and an electronic chip configured for *near-field communication*.” Claim 5 includes materially the same language in limitation [5c], and Petitioners do not offer any independent analysis for claim 5. *See* Petition, 42-43. The remaining challenged claims depend from either claim 1 or 5.

146. For the reasons provided below, in my opinion, I do not consider Fujiwara or Fujiwara combined with Arntzen to disclose or render obvious these limitations.

(1) Fujiwara

147. Based on my review of the Petition, I understand that Petitioners contend that Fujiwara's use of a microwave frequency tag reader “is merely a preferred embodiment...and does not limit the communication **protocol** between the IC tag reader and the IC tag,” Petition, 18, and therefore a POSITA would have

found it obvious to implement Fujiwara using RFID tags as an alternative, and specifically as “NFC tag conformant with ISO 14443.” Petition, 18-19. Petitioners and Dr. Tentzeris appear to contend that this is a “mere substitution” and a “POSITA would have a reasonable expectation of success in doing so.” Ex-1009, ¶¶69-70. I disagree.

148. As an initial matter, the difference between microwave frequency tags and NFC tags is more than just a difference in communication protocol. NFC and Microwave RFID tags (and readers) have vastly different antennas, power requirements, different communication principles and ranges. *See, e.g.*, Section V.C. Neither Petitioners nor Dr. Tentzeris address these differences in design and functionality between the two technologies, or evaluate how they would impact the decision making of a POSITA looking to modify Fujiwara. Accordingly, in my opinion, a POSITA would not have expected to replace Fujiwara’s microwave RFID tags with NFC would be a “simple substitution” because substituting microwave RFID with NFC requires modifications to the entire communication system from hardware to transmission protocols and must account for the materials the tags are placed on and the desired distance of communication.

149. Dr. Tentzeris nonetheless justifies this modification by contending that NFC results in “increased communication security” and “easy massive deployment and maintenance.” Ex-1009, ¶70. But I do not see any evidence in the prior art that

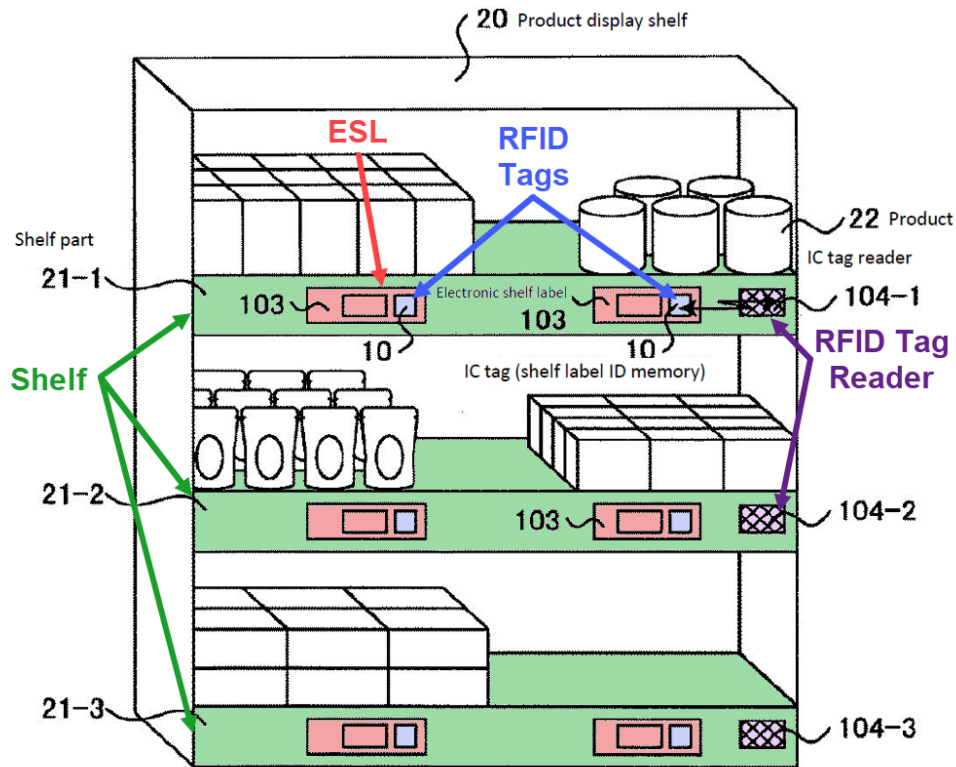
NFC was known to confer these benefits. For instance, although Arntzen discusses that NFC offers security by way of its exceedingly short communication range, Ex-1005, 6:8-9, base NFC is not encrypted, meaning communications could be intercepted even though the communication range is shorter, Ex-2010, 11-12. Indeed, when the '340 Patent discusses increased security, it is in the ability to implement standards that include encryption. *See* Ex-1001, 4:57-59, 6:59-65. Nor was NFC known known to be readily available for mass deployment in the shelf-tag context. To the contrary, in 2011, NFC was primarily used for financial transactions and access control applications, not shelf labels in stores. Ex-2010, 2; Ex-2007, 4.

150. Contrary to Petitioners' assertions about possible advantages, in my opinion, a POSITA would not modify Fujiwara's tags to use NFC not only because they had not been proven to be useful in the shelf-tag context at the time of the patent, but with respect to Fujiwara in particular, using NFC would have rendered the principle embodiments of Figure 4 and 11 inoperable for their intended purpose. *See, e.g.,* Section VIII.A.1.d)

151. For the embodiment of Figure 4, for instance, Fujiwara's tag readers 104 "are provided in a state where the shelf label ID stored in the IC tag 10 integrated in one or more electronic shelf labels 103 **on the same shelf part 21 on the front side of the shelf** can be read collectively without contact at each shelf part 21-1, 21-2,...of the product display shelf 20." Ex-1003, [0066]. In other words, as I show

below in annotated Figure 4, the tag readers 104 are on the same shelf front as the tags 10, and the tag reader must be capable of reading all of the tags on the shelf from that fixed position. As I explained above, a POSITA would have understood that achieving this functionality would require a reader capable of communicating over a considerable distance, which, in my opinion, would have motivated a POSITA to select the disclosed microwave frequency RFID in the first place, and not modify it with a different wireless protocol that could not achieve these same distances. A POSITA would have recognized that NFC would not allow reading of Fujiwara's tags because of its short range and because NFC requires inducing a magnetic field in the receiving tag, which is not possible at the shown distances (especially through a metallic shelf).

[FIG. 4]

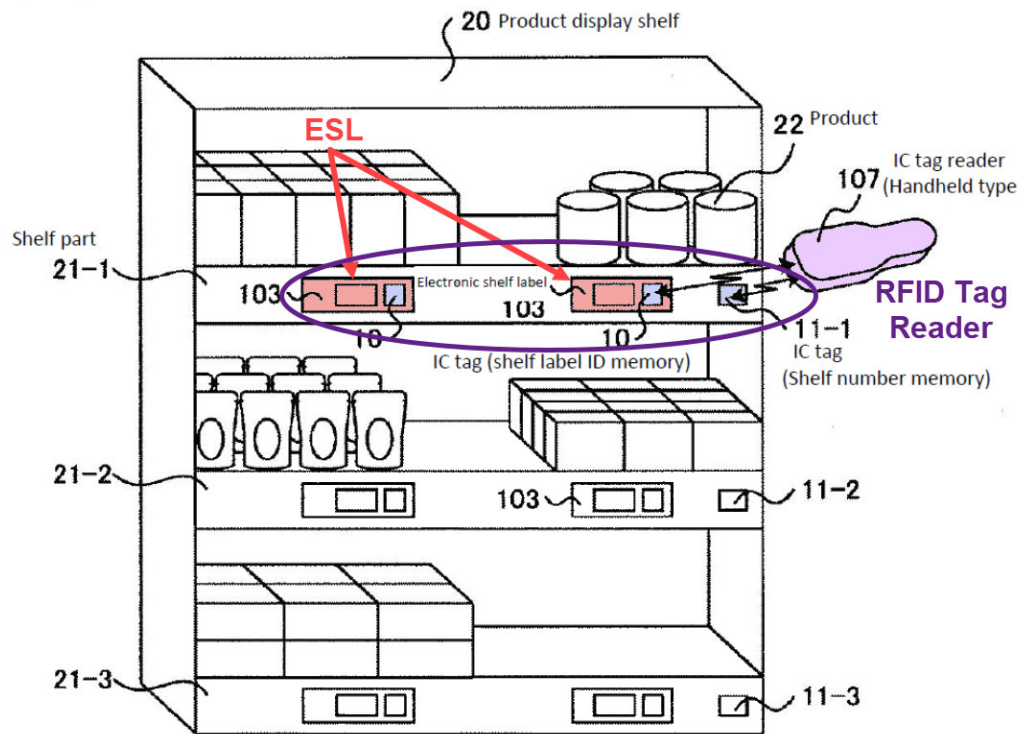


Ex-1003, Fig. 4 (annotated).

152. Similarly, for the embodiment of Figure 11, Fujiwara discloses that *multiple* tags can be read by “manually hold[ing] the hand-held type IC tag reader 107 *over each shelf part* 21 (IC *tags* 10, 11) of the product display shelf 20 when confirming the location of the product (step S1201),” Ex-1003, [0091], and that “[t]he hand-held type IC tag reader 107 reads the IC tags 10 (shelf label ID 311 memory) of **one or more electronic shelf labels 103** of each shelf part 21 of the product display shelf 20 **and the IC tag 11** (shelf number 313 memory),” *id.*, [0090]. Fujiwara also explains that the reader 506 transmits a resonant call-up signal to the tags 10 (S1402) and “receives a response signal from the IC tags 10 of the

surrounding electronic shelf labels 103 (step S1404), and **collectively reads the shelf label IDs 311 stored in the memories of the IC tags 10** (step S1405).” Ex-1003, [0104]. Fujiwara thus discloses reading **multiple tags** simultaneously in these embodiments. Like with the embodiment of Figure 4, a POSITA would have understood that reading multiple tags simultaneously at such a range (for example the entire shelf) would require longer range communication and collision detection available in the disclosed microwave RFIDs. Substituting NFC for microwave RFID would have prevented Fujiwara’s tag reader (107 and 506) from reading more than one tag at a time. For example, (1) the tags would be too far apart so the magnetic field required by NFC would not be able power distant tags and (2) even if the magnetic field could power more than one tag at a time, there would be interference that Petitioners do not account for.

[FIG. 11]



Ex-1003, Fig. 11 (annotated).

153. For these reasons, in my opinion, a POSITA would not have been motivated to replace Fujiwara’s microwave RFID tags—which could achieve reading distances across entire shelf segments and read multiple tags at one time—with NFC that is limited to an exceedingly short range.

(2) Arntzen

154. Based on my review of the Petition, I understand Petitioners contend in Ground 2 that a POSITA would have been motivated to modify Fujiwara in view of Arntzen to incorporate NFC. Petition, 54-55. After reciting various portions of Arntzen, I understand Petitioners to contend that “Arntzen discloses electronic

displays that are functionally and structurally analogous to Fujiwara's IC-tag-embedded electronic shelf labels, and Arntzen's electronic displays are implemented with the claimed NFC technology. Therefore, Arntzen supplies the NFC tag modification." Petition, 55. For the reasons I discuss in detail above, I disagree that a POSITA would have been motivated based on Arntzen to modify Fujiwara to incorporate NFC.

155. Specifically, in addition to the technical deficiencies of NFC to serve Fujiwara's stated purpose of longer-distance tag reading, *see* Sections VIII.A.1.d)(1), VIII.A.1.e)(1), neither Petitioners nor Dr. Tentzeris explain what part of Arntzen's electronic displays would modify Fujiwara's labels, or how such a modification would be accomplished. Instead, Petitioners appear to take the position that simply because NFC existed as a known technology, it could be swapped with microwave RFID—another known technology—despite their different hardware, protocols, and functionality. But without any explanation justifying the change, I do not understand that the fact that a POSITA *could* theoretically make a modification would mean that a POSITA *would* make that modification absent some justifiable reason. In my opinion, neither Petitioners nor Dr. Tentzeris provide that justifiable reason to make such a change. And for the reasons I've already discussed previously, with respect to Fujiwara in particular, a POSITA would not be motivated to replace its microwave RFID tags with NFC tags because that would undermine Fujiwara's

intended functionality of longer-distance tag reading.

2. Claim 6

156. Limitation [6a] recites, in relevant part, “an electronic label which comprises: a radio-frequency communication module configured to receive data representing information relating to an item from a central server.”

157. For the reasons provided below, in my opinion, I do not consider Fujiwara or Fujiwara combined with Arntzen to disclose or render obvious these limitations.

(1) Fujiwara

158. Fujiwara does not disclose a radio-frequency communication module configured to receive data representing item information from a central server. Instead, Fujiwara discloses that its tags communicate with a central server using infrared (which is different from radio frequency) by relaying infrared signals through beacons placed in various zones throughout a store. *See, e.g.*, Ex-1003, [0067] (“The infrared transmitting and receiving unit 603 receives product pricing and information for customers delivered from the store server 101 and transmitted ... from the information distributing device 102”), [0070], [0097]. Infrared technology is used for longer-distance communication, with known benefits and tradeoffs compared to radio-frequency communication, and is often found in devices such as television remote controls.

159. Petitioners appear to acknowledge that Fujiwara does not teach this limitation, but contend that a POSITA's general knowledge of "conventional radio frequency communication" would nonetheless render the claimed "radio-frequency communication module" obvious as a general matter because replacing Fujiwara's infrared module with a radio-frequency module would "harmonize the internal design of two different components (wireless transmitting and receiving unit 603 and IC tag 10) of Fujiwara's electronic shelf label 103 by employing one single communication method for both." Petition, 46. In other words, in order to "harmonize" two communication systems, Petitioners appear to suggest that a POSITA would have been motivated to use NFC to communicate with both a reading device *and* the central server.

160. In my opinion, however, modifying Fujiwara to use NFC to communicate with the store server would have undermined the entire purpose of Fujiwara. Specifically, as I had mentioned, Fujiwara discloses that longer-range communication between labels and the central server occurs through "distributing devices" (102)—not the reading device (131)—placed in various "zones" throughout the store that communicate with each label using infrared and then relay that information to the server. Ex-1003, ¶¶[0045], [0097]. Even Petitioners' prior art, however, recognized that NFC has a range of just a few centimeters. *See, e.g.*, Ex-1005, 6:8-9; Ex-1009, ¶¶46-47.

161. If Fujiwara’s infrared communication module were replaced with NFC, then, the label would need to be taken off a shelf and either brought into centimeter-level distances with the “distributing devices” (102) or the central server itself in order to transmit any information between the two. In my opinion, such a requirement would be extremely inconvenient for store managers and clerks to keep the labels updated, and neither Petitioners nor Dr. Tentzeris appear to address this deficiency.

(2) Arntzen

162. Based on my review of the Petition, I understand Petitioners contend in Ground 2 that a POSITA would have been motivated to modify Fujiwara in view of Arntzen to incorporate a radio-frequency module. Petition, 55. Specifically, Petitioners appear to contend that a POSITA would have been motivated to incorporate Arntzen’s Zigbee (RF communication) network to communicate with a central server. Petition, 55. In my opinion, however, neither Petitioners nor Dr. Tentzeris identify any reason why a POSITA would have been motivated to modify Fujiwara to implement a Zigbee network.

163. Specifically, Arntzen explains that there were two communication methods known in the art at the time: infrared (IR) (like Fujiwara) and radio signals. Ex-1005, 3:31-35. Arntzen also recognized that IR solutions were the most widely sold and implemented (*id.*, 4:26-28) and work well (*id.*, 4:34-5:6). The only

disadvantage Arntzen identifies in using IR is its cost and need for a central database/hub for integrating with a customer's point-of-sale (POS) system. *Id.*, 4:34-5:6. But these supposed disadvantages are not only also true of the ZigBee system, *id.*, 9-13, but they are irrelevant to Fujiwara because Fujiwara already discloses a central database/hub for integrating with a POS system. Ex-1003, Fig. 1.

164. Although Petitioners and Dr. Tentzeris take the position that substituting IR for ZigBee results in “cost reduction, easy installation, and centralized control over those with infrared communications,” Petition, 55, these statements are unsupported. In fact, Arntzen explains that the ZigBee solution has “an uncertain degree of communication” and “reliability of the systems.” Ex-1005, 4:5-9. Furthermore, the ZigBee “solution is also dependent on its own software and PC unit...with the negative responses this often entails.” *Id.*, 4:9-13. And as with the IR system, the ZigBee system must also be integrated with the POS system. *Id.*

165. In my opinion, just because an alternative RF communication system (such as Zigbee) was known does not mean that a POSITA would simply use it. The IR system proposed by Fujiwara was well-known to work for its intended purpose at the time, whereas ZigBee had its own issues. Ex-1005, 4:26-28, 5:12-19. In my opinion, a POSITA would not have undertaken the expense and complexity of modifying the system in Fujiwara with the system in Arntzen, especially when it provided no advantage because Fujiwara's system was already integrated with the

store server.

166. Finally, I understand that Petitioners appear to also refer back to the motivations provided in Ground 1 (Fujiwara alone) as additional motivation to combine Fujiwara with Arntzen. Petition, 55-56. But for Ground 1, Petitioners modify Fujiwara to use NFC only (for the radio-frequency peripheral **and** the radio-frequency communication module) in an attempt to “harmonize” the system to use a signal communication protocol. Petition, 45-50. But Zigbee is a *separate* system and protocol that does not comply with NFC, and thus modifying Fujiwara to use Zigbee would undermine Petitioners’ “harmonization” motivation described in Ground 1.

167. Claim 7 depends from claim 6 and is thus not unpatentable for the same reasons.

3. Claim 7

168. Claim 7 requires “the mobile terminal is adapted to transmit data to the electronic label via the radio-frequency communication module of said electronic label.” This limitation requires that the mobile terminal also transmit to the labels using the RF communication module.

169. For the reasons provided below, in my opinion, I do not consider Fujiwara or Fujiwara combined with Arntzen to discloses or render obvious these limitations.

170. Petitioners appear to argue that, upon modifying Fujiwara's IR communication to use NFC to communicate with the store server, the mobile terminal would also communicate with the label using NFC. Petition, 49-50. As explained above for claim 6, using NFC to communicate with the store server would have been impractical, and, in my opinion, a POSITA would not have been motivated to make such a change. *See* Section VIII.A.2(1).

171. And as I also explained above, Petitioners' reliance on Arntzen in Ground 2 to modify Fujiwara to incorporate Zigbee is, in my opinion, also misplaced. To the extent Fujiwara is modified to use Zigbee to communicate with the store server, the Petition provides no mention of Fujiwara's mobile terminal communicating in this manner.

B. Grounds 3-4: Petitioners do not show the Bandy-Fowler combination or those references in further combination with Arntzen renders any challenged claim obvious

1. Claims 1 and 5

a) Bandy and Fowler do not disclose or renders obvious "vertical and horizontal positions"

172. As explained above, I have assumed that the preamble is limiting. Limitation [1pre] recites "a central server configured to access a planogram *associating a plurality of unique identifiers of radio-frequency peripherals with a plurality of locations within a predetermined area, each of the plurality of locations being defined by a vertical and horizontal position within a plane perpendicular to*

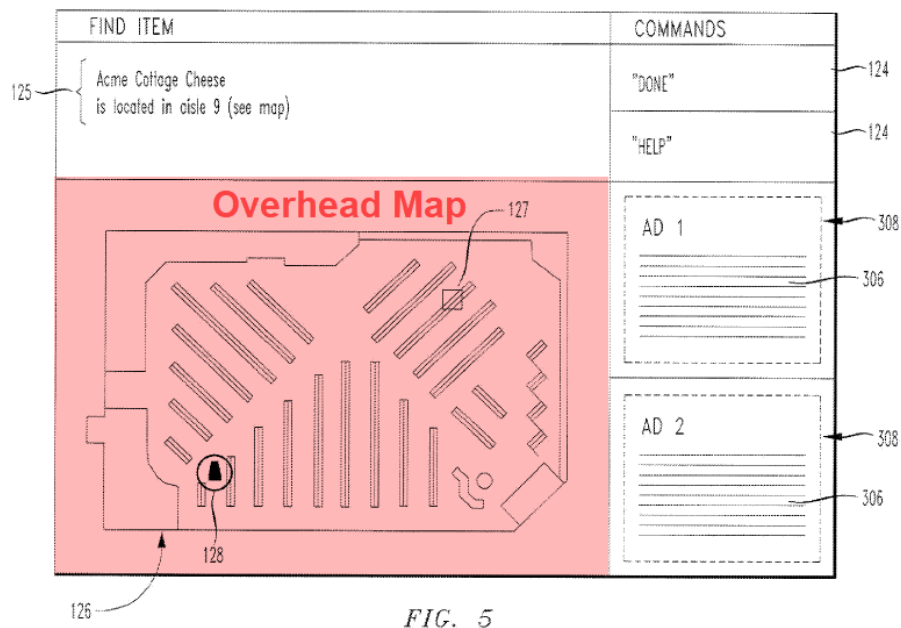
a floor of the predetermined area, and each of the plurality of locations being associated one-to-one with a corresponding unique identifier,” and limitation [1b] re-cites “determining a location of the mobile terminal within the predetermined area based on the location associated with the unique identifier of the received communication in the planogram, *the location of the mobile terminal comprising the vertical and horizontal position of said location.*” Claim 5 includes materially the same language in limitation [5a] and [5f], and Petitioners do not offer any independent analysis for claim 5. Petition, 82-83. The remaining challenged claims depend from either claim 1 or 5.

173. For the reasons provided below, in my opinion, I do not consider Bandy combined with Fowler to disclose or render obvious these limitations.

174. Based on my review of the Petition, I understand Petitioners to contend that “Bandy alone discloses all of [every limitation of [1pre]] except for the ‘vertical and horizontal position’ limitation, while Fowler supplements that limitation.” Petition, 69. Although I agree that Bandy does not disclose the claimed “vertical and horizontal position” required by the claims, I disagree that Fowler rectifies this deficiency for several reasons.

175. First, although Fowler uses the term “planogram” in the specification, Ex-1007, [0221], in my opinion, Fowler never contemplates tracking a vertical position as part of the planogram, as claimed. Instead, Fowler consistently describes

the purpose of the invention as being able to determine the location of a shopping cart in an x-y plane *parallel* to a store floor, which it accomplishes by reading RFID tags of nearby products. *See, e.g.*, Ex-1007, Abstract, [0004]-[0005], [0081], [0088], [0097], [0142]-[0152], [0153] (“With the inventory of locations in the system, locations may then be evaluated to determine cart position as a relative x,y coordinate within store map.”). Fowler then depicts the top-down map as shown in Figures 5 and 15 that is created by tracking the x,y positions of the RFID tags (I have added annotations):



Ex-1007, Fig. 5 (annotated).

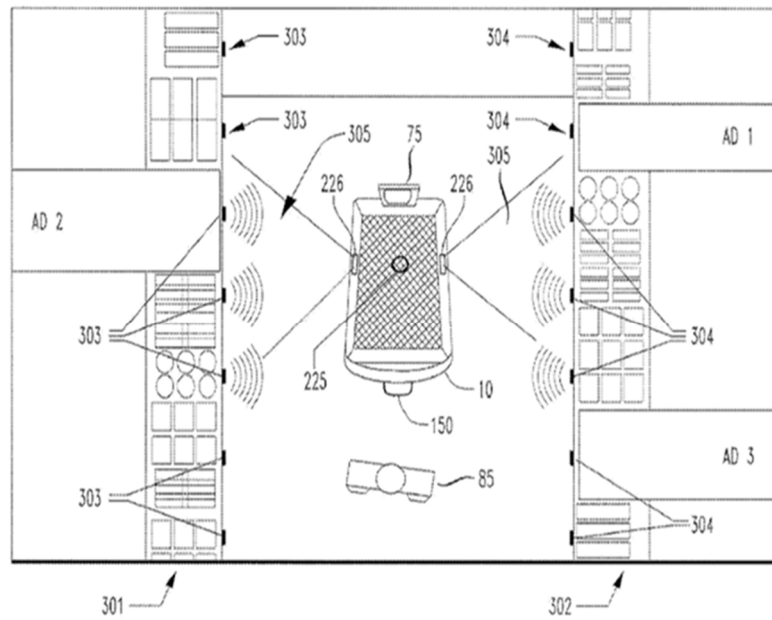
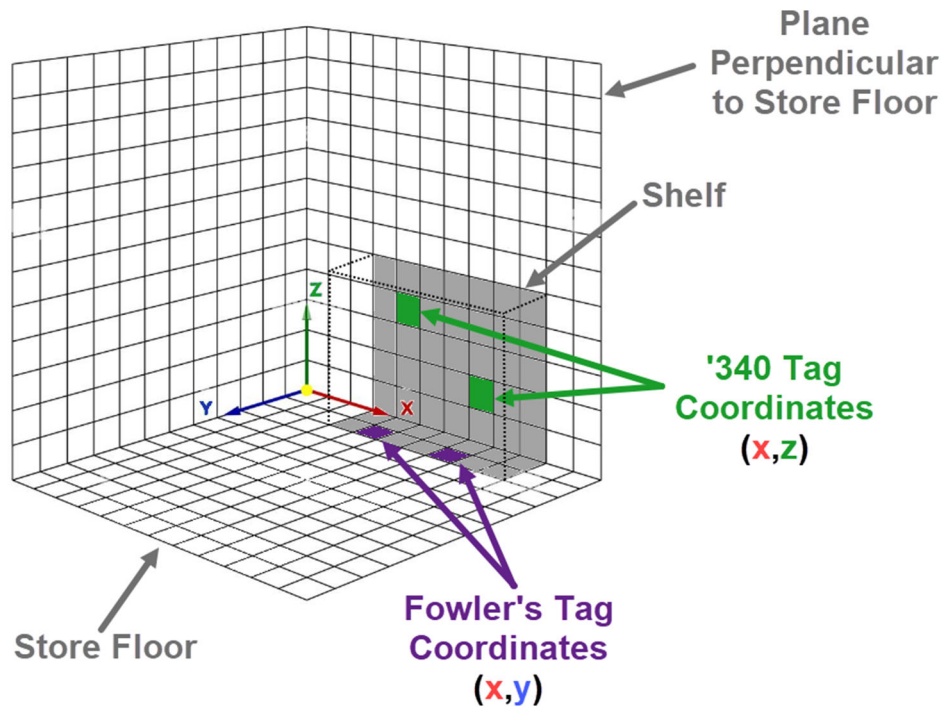


FIG. 15

Ex-1007, Fig. 15.

176. In my opinion, a POSITA would have understood that, to create such a top-down map, all that would be needed is the x,y positions of the RFID tags on a plane *parallel* to the store's floor, consistent with what Fowler discloses. *See, e.g.*, Ex-1007, [0153]. There would be no need for vertical information of the tags (e.g., how high the tags are from the store floor) because that information would not appear on a top-down map. In fact, below I have provided an exemplary plot of a three-dimensional space, in which I compare Fowler's tag-location information with that required by the '340 Patent:



As can be seen, Fowler's top-down map would show a representation of the x,y plane (e.g., store floor), which does not account, and does not need to account, for any vertical information provided by the (z) coordinate. In my opinion, therefore, Fowler does not disclose ever tracking the vertical position of a label in a planogram, as claimed.

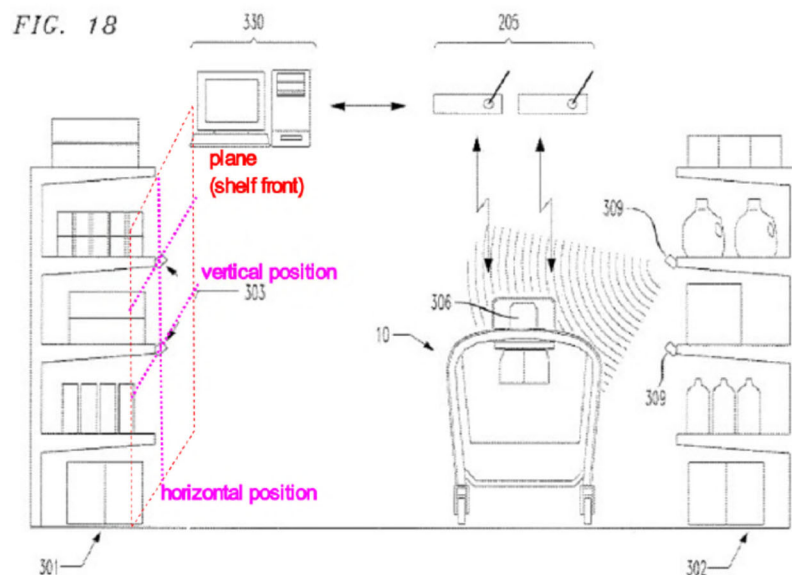
177. Petitioners argue that “[a] POSITA would understand that a location of a product on a shelf or bin **necessarily** comprises a vertical and horizontal position within a plane (the shelf front plane) perpendicular to a floor of the predetermined area of the store.” Petition, 65 (citing Ex-1009, ¶185). But this statement makes the exact same error that Petitioners made above, because the claim does not look to whether a *shelf* has a vertical and horizontal position, but whether the digital

representation of that shelf (i.e., the planogram) has information as to these positions. *See* Section VIII.A.1.b)(1). Moreover, to the extent Petitioners are relying on the legal concept of inherency—which I understand requires demonstrating that a missing element of a prior art reference must **necessarily** be present (and not just merely optional)—I disagree that positional data of labels in a database **necessarily** requires vertical and horizontal positional information. As I noted above, for instance, Fowler does not need a vertical (z) coordinate to render a map of the store floor. And similarly, Fujiwara discloses tracking positional data that simply includes a shelf number, which lacks at least horizontal position information (such as one of either an x or y coordinate). Section VIII.A.1.b)(1).

178. Second, Petitioners contend that “Fowler discloses...building an electronic representation of a base map of a store (the planogram) with ‘a number of reference or anchor RFID tags (e.g., shelf or fixture level tags) placed around the store in known locations.” Petition, 66. And because ““RFID tags located at various heights and locations along the shelves”” and tags can be attached to products, “the ‘known locations’ of the reference or anchor RFID tags that may be associated with each individual product and that may be at different heights and locations along the shelves **necessarily** comprises vertical and horizontal positions of the locations.” Petition, 66-67 (citing Ex-1009, ¶186). Once again, however, neither Petitioners nor Dr. Tenzteris identify any support for these statements as to why “known locations”

referenced by Fowler must *necessarily* include vertical and horizontal positional information. I do not agree that it is necessary, because Fowler discloses only generating a top-down map that uses (x,y) positional information, and not vertical (z) positional information.

179. Third, Petitioners contend that the combination of Bandy and Fowler discloses the recited positions based on Figure 18 (Petitioners’ annotated version reproduced below) and paragraph [0137] of Fowler. Petition, 65-66 (“Fowler further discloses ‘RFID tags located at various heights and locations along the shelves.’”) (citing Ex-1007, [0137]).



Ex-1007, Fig. 18 (annotated by Petitioners).

180. Petitioners’ assertion has at least two significant flaws. First, as with Grounds 1-2, Petitioners annotations do not reflect Fowler’s disclosure of what

positional information is tracked by Fowler's system, because Petitioners are pointing to a representation of a real shelf, rather than the digital planogram representing that shelf. Moreover, Bandy teaches "associat[ing] the identification number with **item 904**" (Petition, 63), not tags, and the Petition does not provide any explanation as to why a POSITA would modify Bandy's item location with Fowler's tag location.

181. As to limitation [1b], specifically, Petitioners cite portions of Fowler that describe having RFID tags at different heights on the shelf, but Fowler discloses that this is only to allow better coverage of the cart-based RFID antennas. Petition, 66 (citing Ex-1007, [0137] (discussing "maximiz[ing] the effectiveness of the reader distribution pattern" and that "the RFID reader/antenna are positioned at approximately the middle of the shelf height, thereby allowing an about equidistant scan pattern above and below the position of the RFID reader/antenna to cover the complete height of the shelf.")). Petitioners further map Fowler's cart as the recited "mobile terminal" (Petition, 72), but, in my opinion, a POSITA would have understood that a device attached to a cart will maintain a constant vertical position (e.g., the height of the cart). In my opinion, there would be no reason for Fowler to try to determine a vertical position of the cart based on RFID-tag height because the vertical position of the cart never changes. To the contrary, Fowler is concerned only with the location of the cart in the x,y coordinates system (top-down) of the base

map, which represents the floor plan of the store. *Id.* I have not seen anything in Dr. Tenzeris' declaration suggesting that Fowler concerned identifying a vertical location, or concerned anything other than a top-down map based on an x,y coordinate system parallel with the store floor. Petition, 66-67 (citing Ex-1009, ¶186), 74-75 (citing Ex-1009, ¶203).

182. In my opinion, Petitioners have not shown the Bandy-Fowler combination teaches the recited “vertical position.”

b) Bandy and/or Fowler do not disclose or renders obvious “an antenna and an electronic chip configured for near-field communication”

183. Limitation [1a] recites the “radio-frequency peripheral includes an antenna and an electronic chip configured for near-field communication.” Claim 5 includes materially the same language in limitation [5c], and Petitioners do not offer any independent analysis for claim 5. *See* Petition, 42-43. The remaining challenged claims depend from either claim 1 or 5.

184. For the reasons provided below, in my opinion, I do not consider Bandy combined with Fowler to disclose or render obvious these limitations.

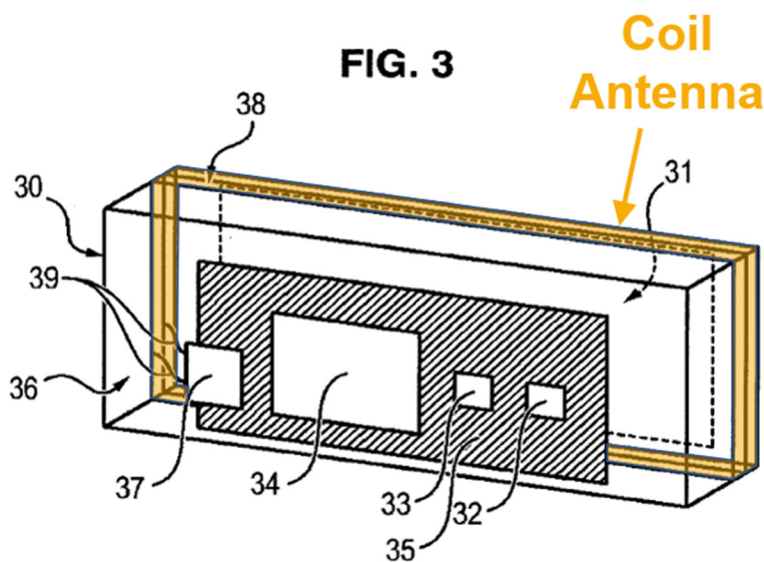
185. Based on my review of the Petition, Petitioners appear to suggest modifying Bandy to use NFC to meet this limitation. Petition, 70-72, 73 (“Bandy alone discloses all of [limitation [1a]] except for the ‘less than twenty centimeter’ limitation, while...a POSITA would have been motivated and able to use the well-

known and conventional NFC standards to modify Bandy's RFID tag."), 90. I do not agree that a POSITA would have embarked on such a modification.

186. Petitioners first argue that because Bandy discloses "reader module 304 performs one or more interrogation/read protocols, as would be known to persons skilled in the relevant art(s), to read tag 902." Ex. 1006, [0055]. "[A] POSITA would be motivated and able to use the NFC standards." Petition, 71. But Bandy discloses as examples "binary protocols, slotted aloha protocols, and those required by the following standards: Class 0, Class 1, and Gen 2." Ex-1006, [0055]. None of these protocols are related to NFC. Rather they are all RFID protocols. Bandy further explains the various protocols can be found in U.S. Pat. No. 6,002,344 (Ex-2013). *Id.*, [0077] (incorporating Bandy '344 by reference). As explained in Section VII.B, a POSITA would have understood that Bandy disclosed a UHF RFID tag, which uses Bandy's example protocols and standards. As I explained above in Section V.C, UHF RFID operates at different frequencies from NFC, uses backscatter instead of magnetic induction, and has a different antenna architecture. Bandy therefore does not disclose using anything other than UHF RFID protocols, and I have seen no reason why a POSITA would have been motivated to look outside UHF RFID protocols for one suitable for use with Bandy's RFID tag.

187. Furthermore, in my opinion, a POSITA would have recognized that NFC was not compatible with Bandy's disclosed RFID tag because the disclosed

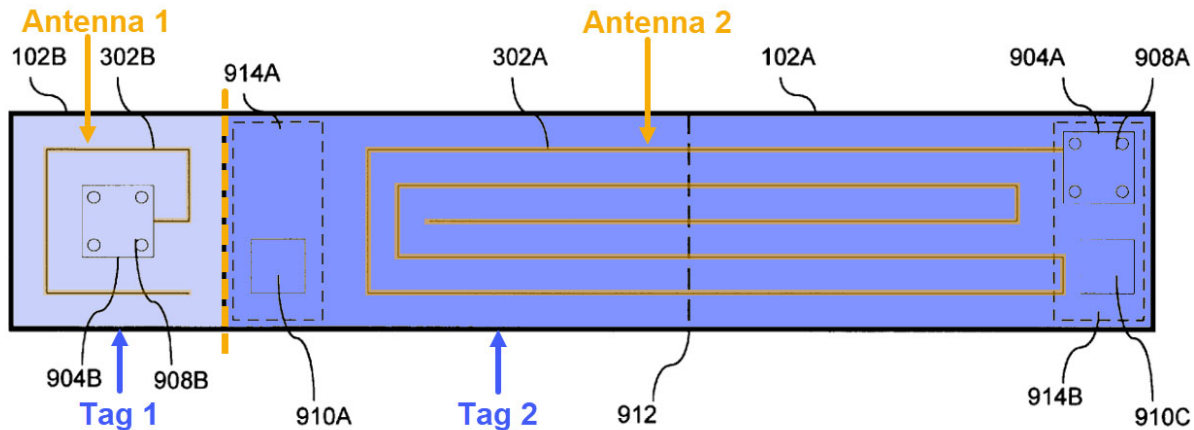
antennas are not compatible with NFC. As explained in Section V.C.2., NFC uses magnetic induction to communicate with and power the tag. A POSITA would have known that such a configuration requires a coil antenna with sufficient turns to receive the magnetic field. *Id.*; Ex-1001, Fig. 4, 5:38-44. I have annotated '340 Patent's Figure 3, below, highlighting the disclosed coil antenna.



Ex-1001, Fig. 3 (Annotated).

188. I have annotated Figure 9 of Bandy '344 below, showing the antennas in Bandy's RFID tag are configured for receiving radiated energy. Antenna #1 has incomplete turns and antenna #2 is a serpentine shape, thus both are not coils. Thus, unlike the '340 Patent's coil antenna, Bandy's antenna would not effectively receive magnetically coupled energy. In my opinion, a POSITA would not have been motivated to modify Bandy's antenna because doing so would have increased the

size of the RFID tag and would have stiffened the tag, making it unsuitable for Bandy's disclosed purpose of placing them on the items themselves. Furthermore, a POSITA would have also had to modify the antenna architecture and supporting circuitry, which Petitioners do not address.



Bandy '344, Fig. 9 (annotated).

189. Furthermore, modifying Bandy to use NFC would have undermined the use of Bandy's tags in many instances. For example, Bandy discloses that "[t]ag 902 may be **attached directly** to item 904, or may be located nearby and be intended to identify item 904." Ex-1006, [0054]; *see also id.*, [0076] ("Thus, tag 1600 can be affixed to items such as airline baggage, retail inventory, warehouse inventory, automobiles, compact discs (CDs), digital video discs (DVDs), video tapes, other goods, and other objects."). Because the tags in Bandy are intended to be attached directly to items, a POSITA would not have considered NFC for several reasons. First, a POSITA have known that NFC tags are far bulkier than RFID tags (which

can be as thin as a few sheets of paper) due to the nature of their antennas, thus making them unsuited for smaller items. That is why Bandy's tags are both flat and flexible. But these same benefits make them ill-suited to implement as NFC, because a flexible tag capable of curving makes magnetic induction more difficult. Second, NFC tags do not work in close proximity to metal or liquid (of which many products are made) because the metal or liquid interferes with the NFC communication. And finally, because NFC has an extremely short communication range (less than 20cm), either the item would need to be removed from the shelf and brought close to the reader in order to scan it, or the scanner would need to be brought into close contact with the item as it sits on the shelf. Given these shortcomings, in my opinion, a POSITA would not have modified Bandy's UHF tags because could remain thin, flexible, had longer communication ranges, and had been shown to work in the presence of metal and liquids. Ex-2006 at R105 ("[A company] has developed RFID tags (Omni-ID Prox™) in the UHF range that work in the presence of metals and liquids. This is a breakthrough for labeling foil-packaged products, canned products, and liquid food products.").

190. In my opinion, a POSITA also would not have been motivated to use NFC with Fowler's RFID tags, primarily because Fowler's RFID reader is located on the shopping cart. Ex-1007, [0136]. Because the claimed NFC operates at less than 20 centimeters, Fowler's reader, which is attached to a shopping cart, would

not be able to communicate with its RFID tags on the shelves unless the cart is practically scraping the shelves, and would likely only be able to pick up items at the same level as the NFC readers built into the cart. Having such a restricted communication range between the cart and tags would be impractical.

c) The Bandy-Fowler-Arntzen combination does not render obvious “an antenna and an electronic chip configured for near-field communication” ([1a], [5c])

191. Based on my review of the Petition, Petitioners appear to further rely on Arntzen in Ground 4 to address NFC. Petition, 91-92. For the reasons I discussed in detail above, however, in my opinion, a POSITA would not have been motivated to modify Bandy combined with Fowler to incorporate NFC. *See* Section VIII.B.1.b).

192. Furthermore, it is unclear to me what the proposed combination is in view of Arntzen. The Petition appears to cross-reference the earlier combination of Fujiwara in view of Arntzen, but the Petition does not explain what part of Arntzen’s electronic displays would modify Bandy’s labels, or how such a modification would be accomplished. Therefore, because neither Petitioners nor Dr. Tentzeris set forth a clear combination with Arntzen, I cannot agree that a POSITA would have been motivated to modify the Bandy-Fowler combination in view of Arntzen.

2. Petitioners fail to show a POSITA would have been motivated to combine Bandy with Fowler, generally.

193. Based on my review of the Petition, Petitioners appear to argue that a

POSITA would have been motivated to use Fowler's teachings regarding location data to modify Bandy's RFID-tag system. Petition, 87-88. But, in my opinion, these systems are not compatible, and neither Petitioners nor Dr. Tentzeris identify a cognizable reason to combine their teachings.

194. Specifically, Bandy discloses "RFID tag and reader technology." Ex-1006, [0004], [0005], [0013]. Bandy describes the user utilizing a mobile communications device to interact with items, such as by interrogating a tag associated with an item of interest. *Id.*, [0034]. In particular, Bandy describes using a mobile communications device such as a cell phone, laptop computer, or handheld computing device to "enhance[] access to items for a user." *Id.*, [0036]. The purpose of Bandy is for the user to request, and the system to provide, information about a particular item that has been scanned. *Id.*, [0023]-[0024], [0049]-[0057], Figs. 7-8. Thus, Bandy discloses using RFID technology in a reader operated by the user to gain information about specifically scanned products, but fails to disclose anything related to the location of the reader.

195. Fowler, to the contrary, uses RFID technology in an entirely different way. Fowler does not use a hand-operated reader that the user can move around freely. *Id.* Instead, Fowler discloses a shopping cart that is provided with a number of RFID antennas. Ex-1007, [0136]. The reader itself may be kept in the housing of the shopping cart, integrated with a video display fixed to the cart, or even located

underneath the cart. *Id.* According to Fowler, the antennas may have a beam “approximately (18) inches wide and approximately six (6) to eight (8) feet high....” *Id.*, [0138]. The specific apertures and radiation patterns are shown in Figures 20A through 20D, reproduced below. *Id.*, [0031]-[0034], [0138].

FIG. 20A

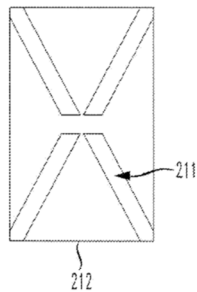


FIG. 20B

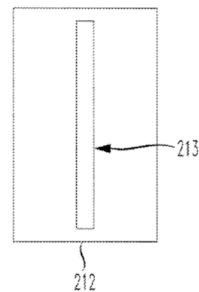


FIG. 20C

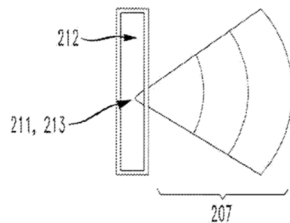
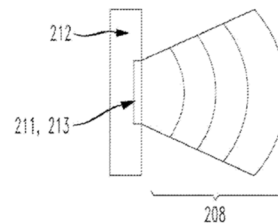


FIG. 20D



Ex-1007, Fig. 20A-D.

196. I have reproduced Figure 15 of Fowler below, which shows an overhead view of the disclosed cart and the associated RFID tags.

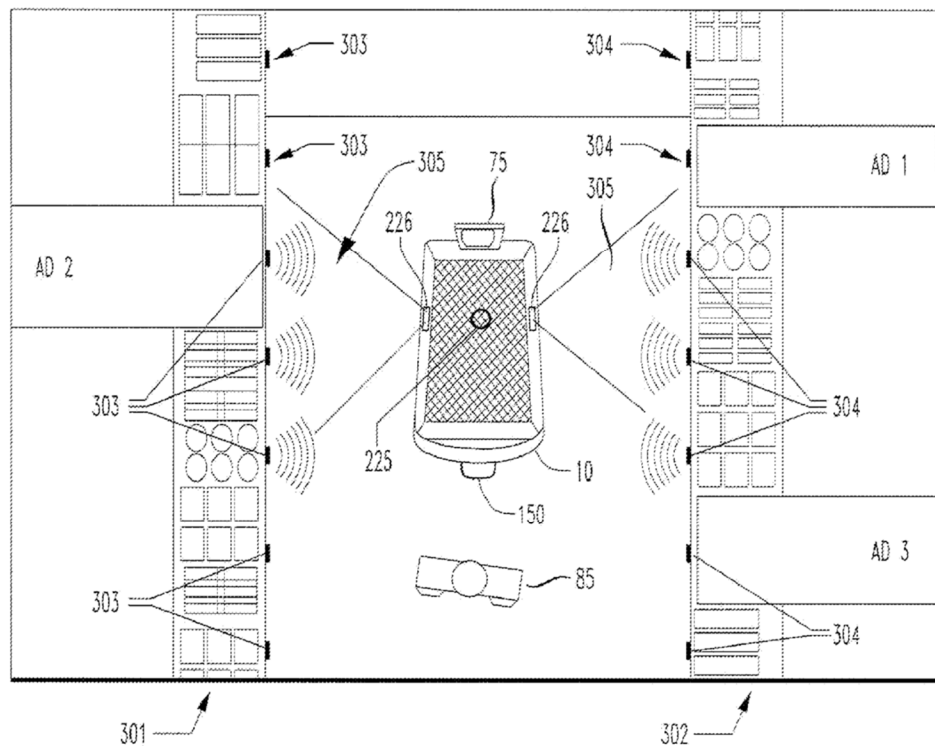


FIG. 15

Ex-1007, Fig. 15.

As shown, items 303 and 304 are the RFID tags distributed throughout the store. *Id.*, [0141]. And items 226 on the sides of the cart are the RFID antennas. *Id.*, [0136]. Fowler provides this configuration of tags and readers to determine the location of the shopping cart based on the interaction of the RFID antennas and the RFID tags. *Id.*, [0004]. Thus, Fowler discloses using RFID technology in a way that is invisible to the user, to locate the cart within the store.

197. In my opinion, Petitioners do not provide any adequate explanation for why a POSITA would be motivated to take the user-driven, location-agnostic system of Bandy and combine it with the user-passive, location-based system of Fowler.

Petitioners suggest that the combination would “make it easier for the customer to find products.” Petition, 88. But Bandy discloses a system where the customer has already found the product and scanned it with the reader. Ex-1006, [0034] (“[T]he user can utilize the mobile communications device to interrogate a tag associated with an item of interest to identify the item, and to use the identification information to download further information about the item.”), Fig. 8. Petitioners do not explain how this would enhance Fowler in any way, and therefore a POSITA would fail to see the benefit(s) Petitioners attribute to Fowler.

198. Furthermore, in my opinion, Petitioners do not explain how the teachings of the two references would be combined. For instance, would the user have to steer the cart disclosed by Fowler towards specific products to get information on those products in the combination? If so, a POSITA would have considered this a worse solution than simply holding a handheld reader up to a product. If on the other hand, Petitioners are proposing putting the location system of Fowler into a handheld device, Petitioners provide no explanation of how that would be accomplished, given Fowler’s extensive and explicit use of multiple of specially designed antennas with a particular beam shape and size in order to properly scan RFID tags without user involvement. *See, e.g.*, Ex-1007, [0138].

199. Petitioners further fail to show how the purported Bandy-Fowler combination meets the limitations of the claims. Instead, Petitioners assert that

various portions of limitations are met by Bandy and/or Fowler alone. For example, for [1a], Petitioners first assert that Bandy meets a portion of the limitation. Petition, 70-72. Petitioners then assert that Fowler meets some other portion of the limitation. *Id.*, 72-73. Then Petitioners take an improper logical leap by concluding “Bandy-Fowler discloses each and every limitation of [1a]....” *Id.*, 73. But Petitioners have never described what the “Bandy-Fowler” combination consists of.

200. Beyond the general incompatibility of Bandy and Fowler, Petitioners fail to sufficiently support the statement that “a POSITA would have been motivated and able to use the command and background knowledge of NFC standards such as ISO 14443, as well as Fowler’s passive RFID tags, to implement Bandy’s RFID tags.” Petition, 90. As described above, Bandy and Fowler have different purposes and use RFID tags in very different ways.

201. Moreover, as explained above, using NFC with either Bandy or Fowler would render their embodiments inoperable. In my opinion, a POSITA would have been dissuaded from modifying Fowler to reduce the communication range to less than twenty centimeters. Fowler discloses specifically designed antennas that have “a beam approximately eighteen (18) inches wide and approximately six (6) to eight (8) feet high....” Ex-1007, [0138]. This would allow the RFID antennas, built into the shopping cart, to detect RFID tags farther away than twenty centimeters. Reducing the communication range to less than twenty centimeters would reduce

the “effectiveness of the reader distribution pattern,” including by preventing the reader from “cover[ing] the complete height of the shelf,” both of which are counter to the stated goals of Fowler. *Id.*, [0137].

202. As I have explained, a POSITA would not have been motivated to combine Bandy and Fowler, and Petitioners have not explained what such a combination would entail. Because Ground 4 also requires combining Bandy and Fowler (with the additional Arntzen reference) (Petition, 91), Petitioners have not shown that a POSITA would be motivated to make that combination either.

3. Petitioners fail to show a POSITA would have been motivated to combine Bandy and Fowler with Arntzen.

203. In Ground 4, “Arntzen supplies the NFC tag modification.” Petition, 92. In other words, Ground 4 is essentially identical to Ground 3, except that where Ground 3 relies on the knowledge of a POSITA (and various NFC standards that Petitioners did not file as exhibits) to modify the purported Bandy-Fowler combination to implement NFC, Ground 4 relies on an explicit combination of Bandy, Fowler, and Arntzen to make that modification. And similar to Ground 3’s failure to show why a POSITA would have been motivated to make such a modification, Petitioners fail in Ground 4 to show why a POSITA would have been motivated to combine Bandy, Fowler, and Arntzen.

204. In my opinion, Petitioners have not provided any supporting analysis as to why a POSITA would have modified Bandy-Fowler to implement Arntzen’s

NFC technology. Instead, I understand that Petitioners rely entirely on the previous motivations in Ground 2. But those motivations do not apply to Bandy-Fowler because Ground 2 pertained to Fujiwara in combination with Arntzen. Petition, 92 (citing Sections III.F and III.G of the Petition).

205. Therefore, because Petitioners fail to show a POSITA would have been motivated to combine Bandy, Fowler, and Arntzen, Petitioners do not have a reasonable likelihood of success of showing any claim is unpatentable for Ground 4.

C. The Petition relies on hindsight to modify Fujiwara and Bandy to use NFC

206. It is my understanding that a challenged patent cannot be used as a roadmap in an obviousness inquiry against itself. But it appears Petitioners do just that to justify modifying Fujiwara and Bandy to NFC. Instead of relying on the challenged patent, it is my understanding that the references themselves must provide some teaching whereby the applicant's combination would have been obvious.

207. The Petition relies on the '340 Patent's disclosure of ISO14443 (5:1-4), increased security (4:56-59), reduced interference (6:54-58), adoption of NFC (4:59-62), short communication distance (5:45-48, 6:52-54). *See* Petition, 19 ("realizing the advantages of increased and standardized communication security and reduced interference"), 71, 90 ("A POSITA...would further have been familiar with the

industry trend to implement RFID tags with NFC protocols and standards such as ISO 14443”). Petitioners used this disclosure in the ’340 Patent to search for various prior art, in an attempt to justify their hindsight analysis. Petition, 28 (citing Ex-1009, ¶¶46-53).

IX. CONCLUSION

208. This declaration and my opinions herein are made to the best of my knowledge and understanding, and based on the material available to me, at the time of signing this declaration. I declare that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true, and further, 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.

Date: September 6, 2024



Rajeev Surati, Ph.D.