

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

Petitioners

v.

SES-IMAGOTAG INC.

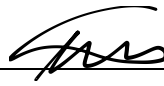
Patent Owner

Case No.: IPR2024-00189

Patent No. 10,674,340

REPLY DECLARATION OF DR. MANOS M. TENTZERIS
REGARDING U.S. PATENT NO. 10,674,340

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.

By: /  /

Manos M. Tentzeris, Ph.D.

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I. INTRODUCTION

1. I have been retained by counsel for Hanshow America Inc. and Hanshow Technology Co., Ltd. in the above-captioned proceeding. I have been asked to provide an opinion regarding the patentability of certain claims in U.S. Patent No. 10,674,340 (the “’340 Patent”) (Ex. 1001). I previously submitted a declaration in this matter as Exhibit 1009. My background and qualifications are set forth in my opening declaration, Exhibit 1009. A copy of my CV was submitted as Exhibit 1008. I disclosed the compensation I am receiving, and prior testimony in my opening declarations. I also set forth my understanding of the relevant legal standards in my opening declarations.

2. I understand that SES-Imagotag Inc. submitted responses to the petitions and the Institution decisions, and that SES-Imagotag Inc. submitted a declaration from Dr. Rajeev Surati (Ex. 2001). I have considered SES-Imagotag Inc.’s Responses and Dr. Surati’s declarations, and this declaration sets forth my reply to certain of SES-Imagotag Inc.’s and Dr. Surati’s arguments.

3. I have reviewed all Exhibits cited by SES-Imagotag Inc. and considered by Dr. Surati. In addition, I have reviewed following prior art and corroborating references.

Exhibit No.	Description
1011	U.S. Patent App. Pub. No. 2013/0048721 (“Rasband”)

1012	Deposition Transcript of Dr. Rajeev Surati (“Surati Dep. Tr.”)
1013	U.S. Patent App. Pub. No. 2012/059741 A1 (“Khan”)
1014	U.S. Patent App. Pub. No. 2014/0195925 A1 (“Wikander”)
1015	U.S. Patent No. 7,937,107 B2 (“Rofougaran”)
1016	U.S. Patent App. Pub. No. 2010/0161434 A1 (“Herwig”)
1017	U.S. Patent App. Pub. No. 2008/0255947 A1 (“Friedman”)
1018	Japan Patent Application Publication 2007-155383A (“Sakata”)
1019	Certified Translation of Japan Patent Application Publication 2007-155383A
1020	Japan Patent Application Publication 2009-64316A (“Akao”)
1021	Certified Translation of Japan Patent Application Publication 2009-64316A
1022	U.S. Patent No. 7,973,722 B1 (“Hill”)
1023	microID® 13.56MHz RFID System Design Guide by Microchip Technology Incorporated (2004)
1024	Taiwan Patent No. M353498 (App. No. 97219709) (“Kong”)
1025	Certified Translation of Taiwan Patent App. No. 97219709
1026	China Patent No. CN 202068693 U (“Yang”)
1027	Certified Translation of China Patent No. CN 202068693 U
1028	An Introduction to RFID Technology by Roy Want, IEEE Pervasive Computing, February 2006
1029	RFID Handbook: Fundamentals and Applications in Contactless Smart Cards and Identification, Second Edition by Klaus Finkenzeller, translated by Rachel Waddington, Wiley 2003

1030	Flexible tag microlab development: Gas sensors integration in RFID flexible tags for food logistic by Estefania Abad <i>et al.</i> , Sensors and Actuators B 127 (2007) 2-7
1031	AN1445: Antenna design guide for MFRC52x, PN51x and PN53x, Rev. 1.2 (11 October 2010) by NXP Semiconductors

II. RESPONSE TO DR. SURATI’S OPINIONS

A. “Planogram”

4. I understand that Dr. Surati has opined that a POSITA would understand that the ’340 Patent uses the word “planogram” consistent with his proposed “general understanding.” Ex. 2001, ¶77. I do not agree with his opinion.

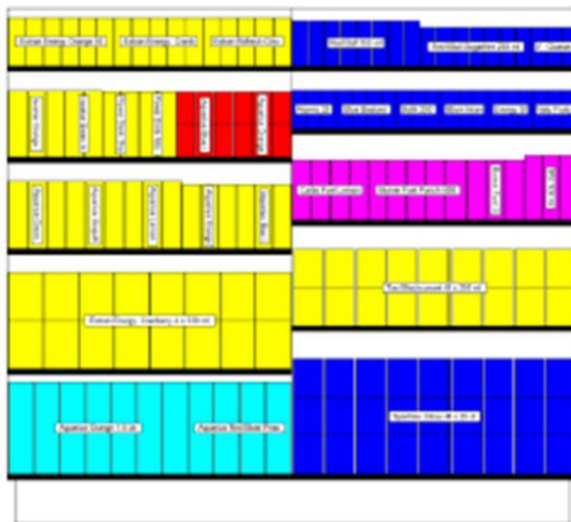
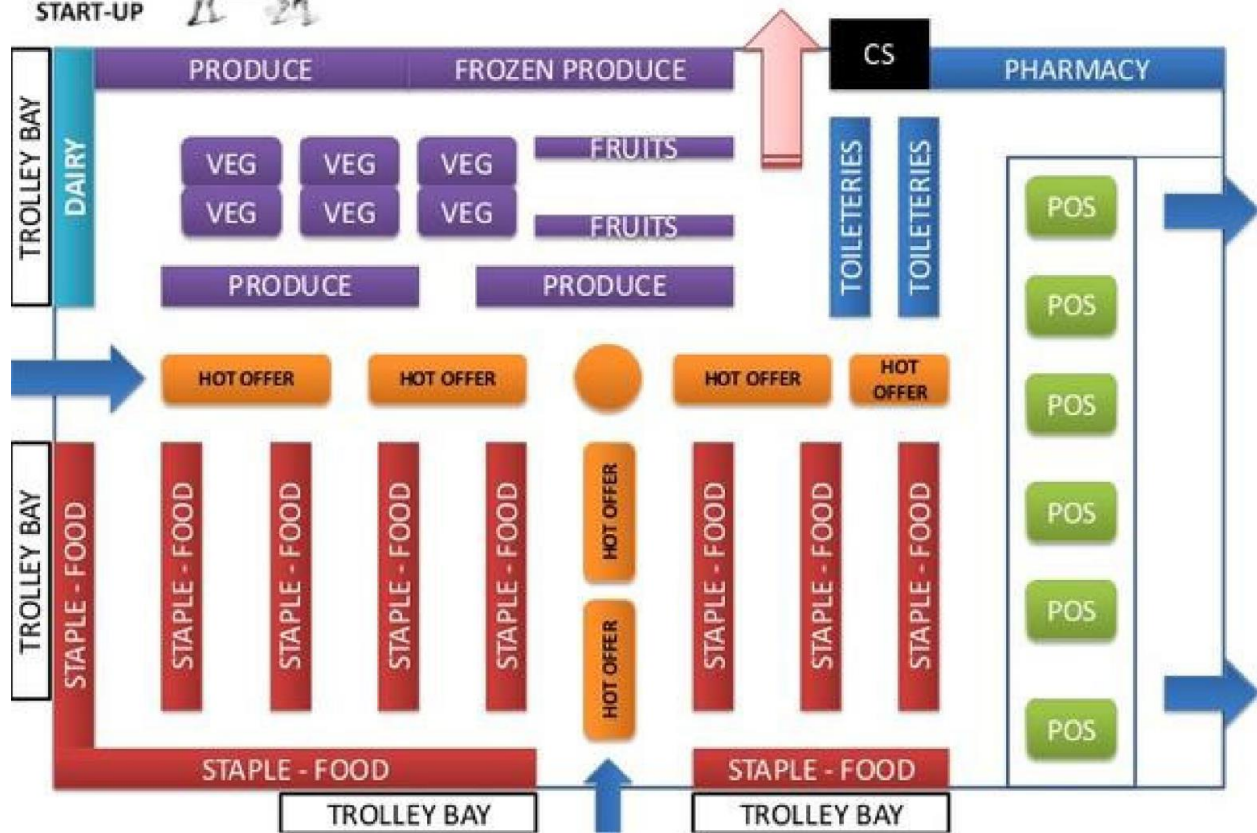
5. First, I do not perceive a clear scope of Dr. Surati’s proposed “general understanding.” I understand that Dr. Surati made the following propositions in his declaration:

- a. “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.” Ex. 2001, ¶73.
- b. “‘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.” Ex. 2001, ¶74.
- c. “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.” Ex. 2001, ¶76.
- d. “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. 2001, ¶76.
6. I also understand that Dr. Surati included the following graphics in ¶75 of his declaration as exemplary representations of “planograms” according to his proposed “general understanding.”



PHASE 1 : GROUND FLOOR – 10,000 Sq. Ft.



Planogram as a schematic



Planogram with Live Images

7. In my opinion, Dr. Surati failed to provide a consistent and definite scope for his “general understanding” of the term “planogram.” For example, it is unclear whether “how high off the ground” is an essential feature of Dr. Surati’s “general understanding,” as it only appears in one of his several propositions, and is not shown on his first exemplary graphic. For another example, it is unclear whether “how much shelf space is dedicated to each product” is an essential feature of Dr. Surati’s “general understanding,” as it similarly does not appear on his first exemplary graphic, and further is not disclosed anywhere in the ’340 Patent itself.

8. In fact, in my opinion, Dr. Surati’s first and last propositions do not place any requirement on the specifics of the information contained in the planogram, and are not in conflict with the Board’s interpretation of the term “planogram” in its decision to institute. Paper 11, at 27 (“the planogram of the ’340 patent is merely a list of locations of labels and associated locations and the items on sale”). On the other hand, Dr. Surati’s second and third propositions assemble, from extrinsic sources unrelated to the ’340 Patent, various requirements on what information is included in the planogram, with no single source clearly showing every item in his list. It is my opinion that such indiscriminate assembly of information from unrelated sources cannot be a reliable methodology to reach a “general understanding” of the term.

9. Second, I do not agree with Dr. Surati’s application of his “general understanding” to the ’340 Patent. Dr. Surati points to various disclosures from the

'340 Patent, Ex. 2001, ¶77, but none of them supports Dr. Surati's heterogeneous and inconsistent requirements on the information contained in a planogram. In particular, none of them shows that the planogram must contain information of "how much shelf space is dedicated to each product."

10. Dr. Surati also opines that the prosecution history of the '340 Patent supports his understanding of the term. Ex. 2001, ¶78. In particular, he points to the Applicant's statement that the prior art *Egan* (Ex. 2003) discloses a "planogram." *Id.* However, in my opinion, Dr. Surati failed to discuss what the definition of "planogram" in *Egan* is and how it applies to the disclosures of the '340 Patent. I have considered *Egan* and I understand it defines "planogram" as "custom product assortment and product placement plans." Ex. 2003, at 1:16. In my opinion, this definition is fully compatible with the Board's interpretation of the term, and does not conform to Dr. Surati's propositions of the "general understanding" of the term.

11. Therefore, I do not agree with Dr. Surati's opinion. It is my opinion that the Board's interpretation of the term in its Decision to Institute is correct.

B. "Activated"/"Activating"

12. I understand that Dr. Surati opined that "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." Ex. 2001, ¶81. I disagree with Dr. Surati's opinion. It is my

opinion that “activated” has its plain and ordinary meaning, which is “put into action,” and does not require the radio-frequency peripheral to be powered by the mobile terminal.

13. In my opinion, Dr. Surati’s opinion is based on his reading of a specific embodiment of the ’340 Patent. However, it is my understanding, that it is improper to limit a POSITA’s understanding of the claim terms to any specific embodiment alone.

14. In my opinion, the claim language and the disclosures of the ’340 Patent are compatible with passive *and* active radio-frequency peripherals, and do not limit the relevant claim terms to passive radio-frequency peripherals alone. For example, the ’340 Patent states that “[t]he radio-frequency peripheral 36 of the electronic label 3 comprises an antenna 38 and an electronic chip 37 of NFC type (Near Field Communication) or RFID type (Radio Frequency Identification).” Ex. 1001, 4:54-56. Therefore, in my opinion, the ’340 Patent envisaged its radio-frequency peripheral to include other types than the passive NFC type that Dr. Surati focuses on, and is compatible with the radio-frequency peripheral being, for example, an active NFC tag.

15. In my earlier declaration, I discussed active and passive RFID tags. Ex. 1009, ¶52. In the same declaration, I also discussed NFC tags and stated that they are likely to be implemented as passive RFID tags. *Id.*, ¶53. However, I understand that active

NFC tags also exist, and my earlier declaration did not rule them out. Further, it is my opinion that the '340 Patent does not exclude the use of active NFC or RFID tags. In addition, it is my opinion that a POSITA would understand that an active NFC or active RFID tag is powered by its own power source, and not by any other device such as a mobile terminal, nor by any electromagnetic wave energy transmitted to it from any other device such as mobile terminal.

16. It is further my opinion that a POSITA would understand that an active NFC or active RFID tag, when not in communication with other devices, stays for a considerable portion of time in a relatively-low-power-consumption mode, and when another device such as a mobile terminal intends to initiate communication with the active NFC or active RFID tag, the other device will send an interrogation or call-up signal to the active NFC or active RFID tag, which, upon receipt of the interrogation or call-up signal, will switch into a relatively-high-power-consumption mode and engage in communication. It is also my opinion that a POSITA would understand that the other device, through such interrogation or call-up signal, “activates” the active NFC or active RFID tag in the plain and ordinary sense of the word, that the other device, through such interrogation or call-up signal, puts the active NFC or active RFID tag into the action of communication. I have also considered U.S. Patent App. Pub. No. 2013/0048721 (“Rasband”) (Ex. 1011), a reference cited by the '340 Patent itself. I see that Rasband discloses that

“tag 14 may be an active, passive, semi-active tag, among other types of tags. For example, an active tag may include tags that use batteries to power their respective circuitry throughout the tag interrogation process. Semi-active tags may include tags that use batteries to power their respective circuitry through part of the tag interrogation process. For example, the batteries may provide the power needed to transmit an encoded data signal to the scanner or reader in response to receiving an interrogation signal.” (Ex. 1011, [0031]). It is my opinion that the “interrogation process” disclosed in Rasband, with interrogation signals and response signals (which clearly applies to both Rasband’s “active” and “semi-active” tags), for its active tags is consistent with how a POSITA would understand the process in which an active NFC or RFID tag is “activated” or “put into action.” Further, it is my opinion that prior art Fujiwara (Ex. 1003)’s disclosure of a tag reader transmitting a “resonant call-up signal” to a tag and the tag transmitting a response signal (e.g. Ex. 1003, [0082], [0084]-[0085], [0091]-[0092], [0103]-[0104]) is also consistent with how a POSITA would understand the process in which an active NFC or RFID tag is “activated” or “put into action.” It is further my opinion that prior art Bandy (Ex. 1006)’s disclosure of “interrogation/read protocols” (Ex. 1006, [0055]) is also consistent with how a POSITA would understand the process in which an active NFC or RFID tag is “activated” or “put into action.” My opinion is further corroborated by my consideration of U.S. Patent No. 7,546,948 (Ex. 2022), a

reference that Dr. Surati considered (Ex. 2001, ¶¶4, 128), which discloses (Ex. 2022, 7:26-41), in Dr. Surati's own words, that "resonant RFID systems can be active or passive." (Ex. 2001, ¶128).

17. In fact, Dr. Surati's own explanation of a disclosure from the '340 Patent supports my opinion. Dr. Surati summarizes 5:65-67 of the '340 Patent as "the radio-frequency peripheral uses near-field communication (or "NFC") to activate and set up communication with the mobile terminal." Ex. 2001, ¶81. The original text reads: "At first, the mobile terminal 1 sets up a communication via radio-frequency with a radio-frequency peripheral 36 of an electronic label 3 (Step 51)." Ex. 1001, 5:65-67. Thus, in my opinion, although Dr. Surati mistakenly flipped the radio-frequency peripheral and the mobile terminal in his summarization, he apparently treats "activate" as synonymous to "set up communication", or to "put into the action of communication," which is consistent with the plain and ordinary meaning of the claim term, which is "put into action," and his understanding of this disclosure is further consistent with the interrogation process of Rasband, with the call-up signal and response signal sequence of Fujiwara, and with the "interrogation/read protocols" of Bandy.

18. I further understand that the Patent Owner argues that my deposition testimony supports Dr. Surati's opinion. Paper 21, at 25¹. However, in that sentence, I was only discussing a typical configuration of NFC tags and NFC readers. Ex. 2024, 13:24 ("Typically, that's the configuration.") I was not stating that this is the only possible configuration or that this is the only possible way of activating the radio-frequency peripheral of the '340 Patent. Therefore, I disagree with the Patent Owner's interpretation of my deposition testimony.

C. Bandy's antenna is compatible with near-field communication.

19. I understand that Dr. Surati opined that "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." Ex. 2001, ¶187. I disagree with Dr. Surati's opinion.

20. First, Dr. Surati based his opinion upon his other opinion that "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." Ex. 2001, ¶187. Dr. Surati further argues that, of the two antennas shown in Figure 9 of Bandy-344 (Ex. 2013), a patent application

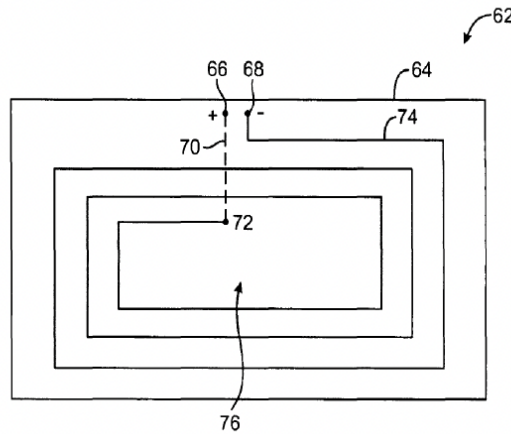
¹ The citation on that page shows "Ex-2021, 13:21-24." The exhibit number is wrong. It should be Ex-2024.

incorporated by reference into Bandy, the left one has incomplete turns and the right one is a serpentine type, and thus neither is a coil, so neither is not compatible with NFC. *Id.*, ¶188. I disagree with this requirement of a “coil antenna” and this rejection of Bandy-344’s antennas.

21. In my opinion, neither the ’340 Patent nor Bandy (with the incorporation of Bandy-344 (Ex. 2013)) specifies the type of antennas. The relevant disclosure from the ’340 Patent, 4:50-56, reads “The radio-frequency peripheral 36 of the electronic label 3 comprises an antenna 38 and an electronic chip 37 *of NFC type or RFID type*. A radio-frequency peripheral of NFC type operates at a frequency of 13.56 MHz similar to a radio-frequency peripheral of HF RFID type.” (emphasis added). Further, Bandy does not specify any specific frequency band for RFIDs in an invention that could be applied effectively for both HF and VHF bands. In fact, Bandy explicitly discloses that “[t]he present invention is directed to all types of RFID tag devices.” Ex. 1006, [0074]. Thus Bandy is directed, among others, to HF RFID tags, which uses the same standards and peripherals as NFC devices. *See* Ex. 2010 (a prior art document considered by Dr. Surati, *see e.g.* Ex. 2001, ¶4), at 9. It is my opinion that the ’340 Patent and Bandy are thus both compatible with a large range of similar antennas, which could be utilized interchangeably.

22. In addition, I have considered US 7,973,722 B1 (Ex. 1022, the “’722 Patent”), which was filed in 2007 under the title of “Electronic Device with Conductive

Housing and Near Field Antenna,” and was cited in Exhibit 2025. This patent discloses a near field communication antenna having either a spiral conductor layout or a symmetric conduct layout. Ex. 1022, FIGS. 2-5. Among them, the spiral conduct layout (FIG. 3) is particularly similar to the antenna 302A of Fig. 9 of Bandy-344, which Dr. Surati defined as “serpentine.”



Ex. 1022, FIG. 3

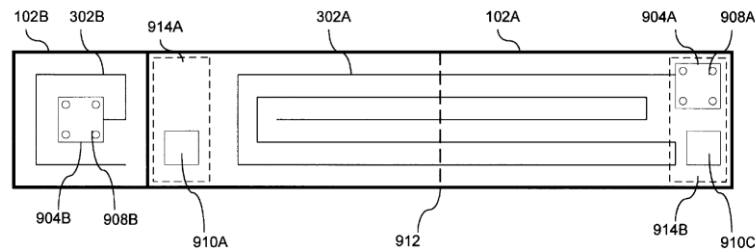
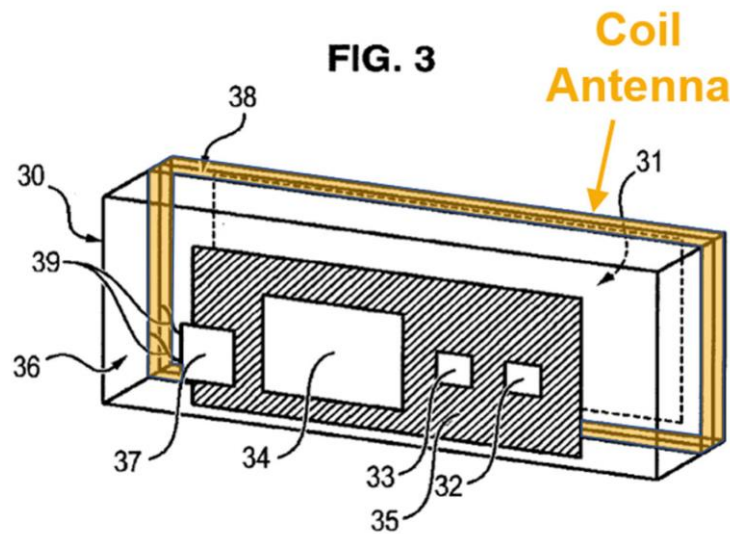


FIG. 9

Ex. 2013, FIG. 9.

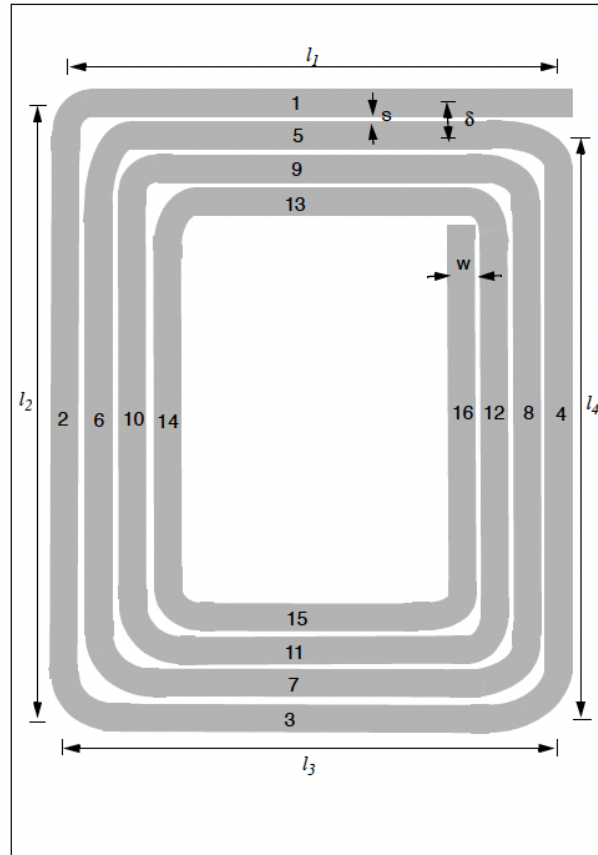
23. The '722 patent further discloses that “[o]ther suitable antenna configurations may be used for antennas 42 and 44 if desired. For example, antennas 42 and 44 may have spiral loops formed in a circle, an oval spiral of loops, loops formed in a polygonal shape with no curved sides, loops formed in a polygon with at least one curved side, etc.” Ex. 1022, 5:59-64. In my opinion, these layouts are planar spiral layouts more similar to the antenna 302A of Bandy-344 than to the antenna shown on Fig. 3 of the '340 Patent (that Dr. Surati described as a “coil antenna with sufficient turns”).



Ex. 1001, Fig. 3 (annotated by Dr. Surati, see Ex. 2001, ¶187)

24. I have also considered a document titled “microID® 13.56 MHz RFID System Design Guide” from 2004 (Ex. 1023). This document also discloses a rectangular planar spiral antenna. Ex. 1023, at 114 (image for Example 7). In my opinion, this antenna layout, which is specifically designed for RFID 13.56MHz (and therefore

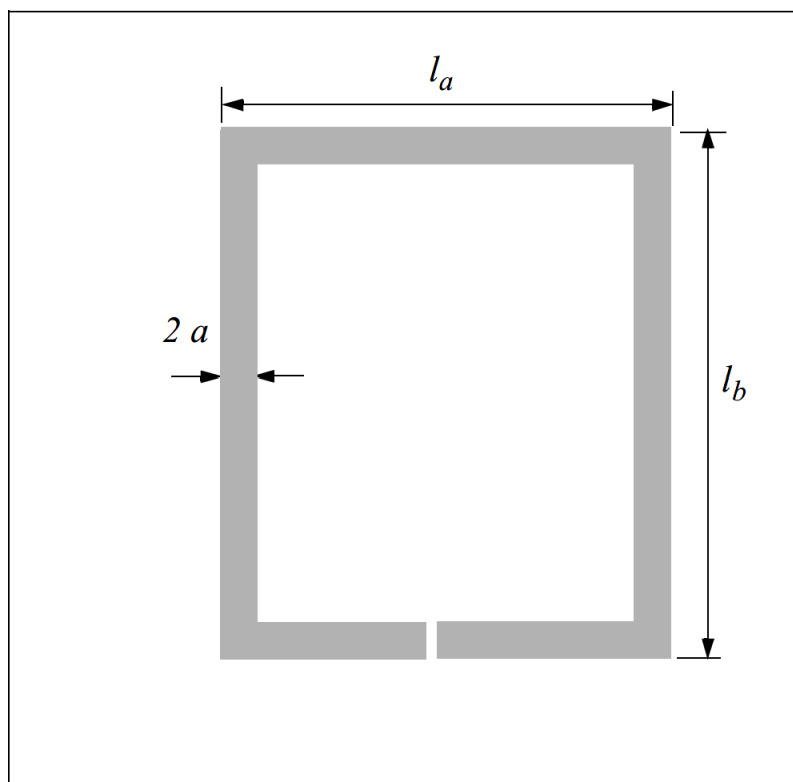
for NFC use, *see* Ex. 1009, ¶¶52-53; Ex. 2001, ¶64), is also more similar to the antenna 302A of Bandy-344 than to the antenna shown on Fig. 3 of the '340 Patent.



Ex. 1023, at 114 (image for Example 7).

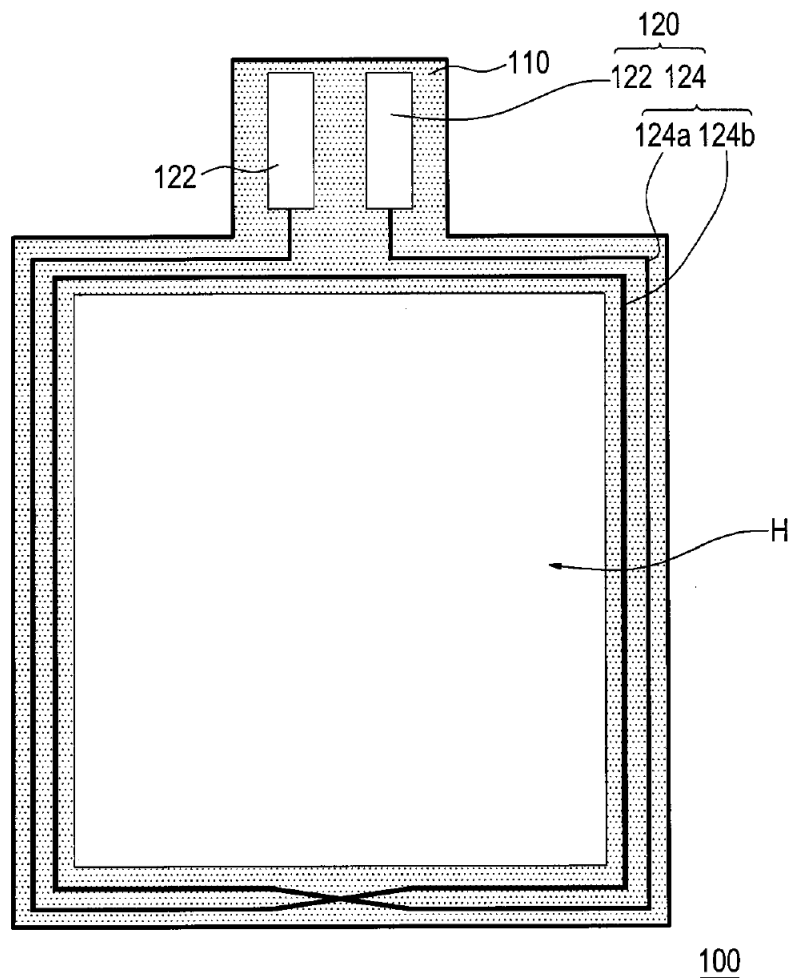
25. Notably, the NFC guide as discussed above explicitly discloses a “one turn reader antenna.” Ex. 1023, at 112. In my opinion, this antenna layout, which is again specifically designed for RFID 13.56MHz (and therefore for NFC use) and which apparently has an “incomplete” turn, is remarkably similar to the antenna 302B of Fig. 9 of Bandy-344, and apparently does not possess the “sufficient turns” that Dr. Surati requires for NFC antennas.

FIGURE 14: ONE TURN READER ANTENNA

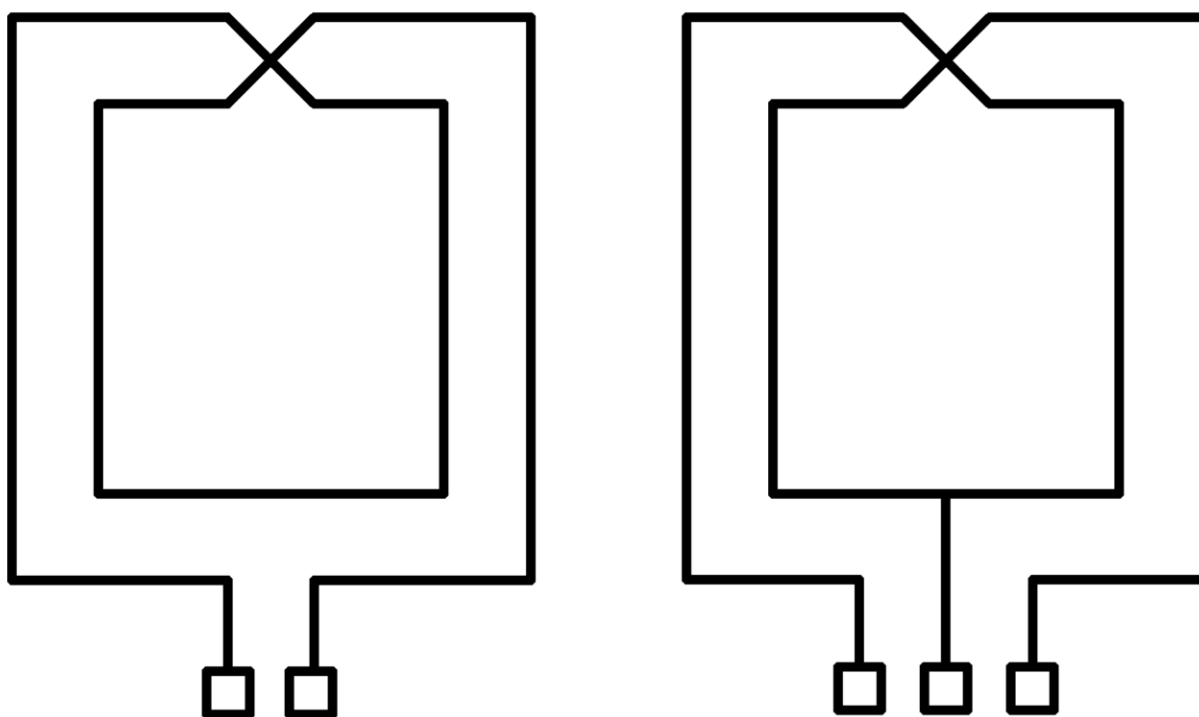


Ex. 1023, at 112 (Figure 14).

26. I have also considered certain other references cited in Ex. 2025, which similarly disclosed planar antenna designs suitable for NFC use without many turns. See Ex. 1025 (TW Patent App. No. 97219709, “NFC Antenna”, filed in 2008), FIG.1; Ex. 1027 (CN202068693U, granted in 2011) , FIGS. 1-2 (disclosing single-end-type NFC antenna and differential-type NFC antenna).



Ex. 1025, at 13 (FIG. 1).



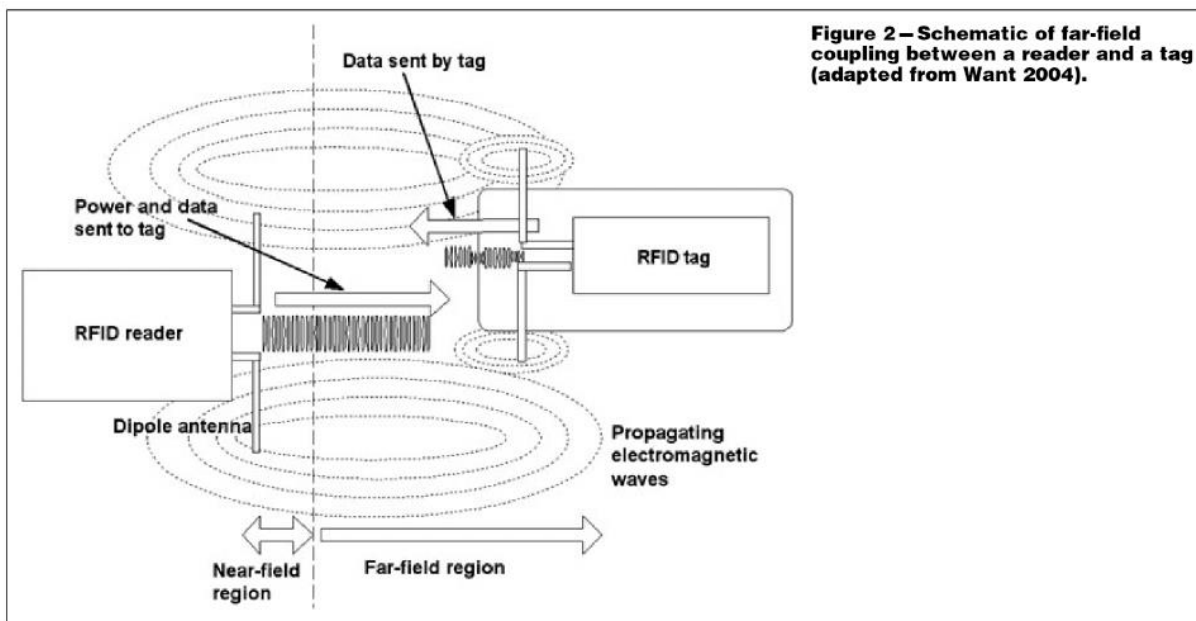
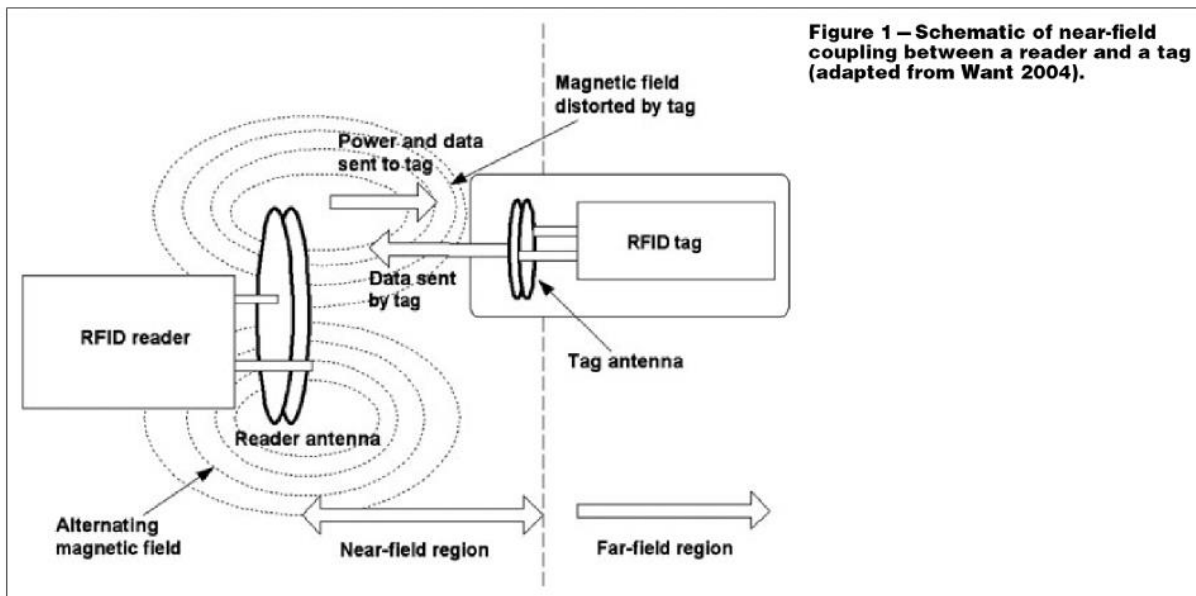
Ex. 1027, at 13 (FIGs. 1-2).

27. Therefore, I disagree with Dr. Surati's requirement of a coil antenna with sufficient turns for NFC communications. In my opinion, the antennas shown on Fig. 9 of Bandy-344 are compatible with NFC.

28. Second, Dr. Surati argues that the antennas in Figure 9 of Bandy-344 are configured for receiving radiated energy, not magnetically coupled energy. Ex. 2001, ¶188. I disagree with this analysis of the antennae depicted on Figure 9 of Bandy-344.

29. It is well known to a POSITA that HF RFID antennas with configurations shown for the antennas in Fig. 9 of Bandy-344 may receive magnetically coupled energy. I have considered "Overview of RFID Technology and Its Applications in

the Food Industry” (Ex. 2006), an exhibit considered by Dr. Surati. Ex. 2001, ¶ 4 (citing Ex. 2006). This article shows, in FIGS. 1-2, antenna configurations for near-field (magnetic) coupling (suitable for 13.56MHz systems) and for far-field coupling (suitable for UHF systems). It is my opinion that the antennas shown in Fig. 9 of Bandy-344 are compatible for magnetically coupled energy because they are closer to the near-field antenna in FIG. 1 of Ex. 2006 as compared to the straight “dipole antenna” that is similar to radio antennas in FIG. 2 of Ex. 2006. Further, the same paper discloses that a “smaller magnetic coil” would allow magnetic induction and is suitable for a passive RFID system of 13.56MHz, which has a practical operating range between 0.01 and 0.30m (that is, NFC range). *Id.* at R102. Thus it is further my opinion that the small spirals shown in Fig. 9 of Bandy-344 are configured for receiving magnetically coupled energy and suitable for NFC use.

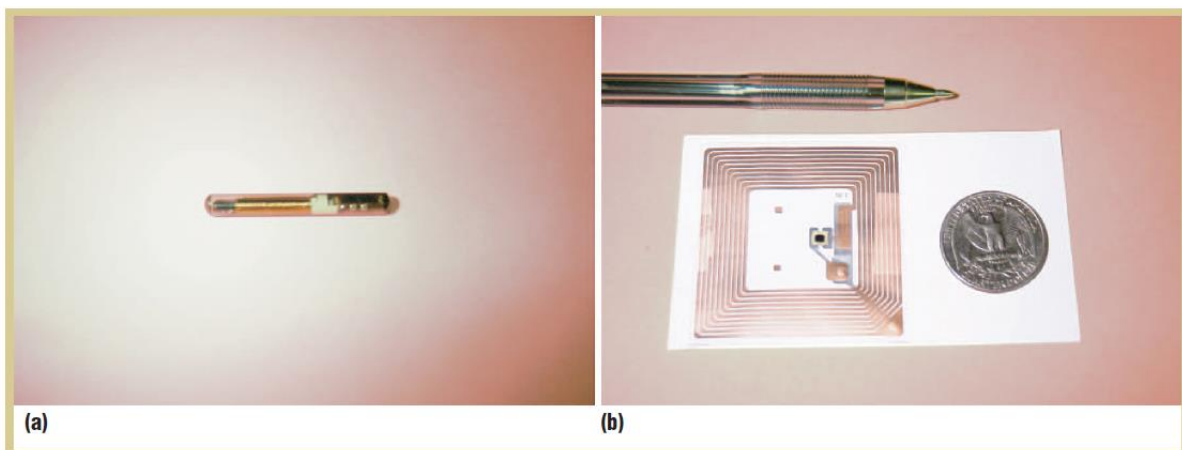


Ex. 2006, FIGS. 1-2.

30. Dr. Surati also argues that the antennas shown on Figure 9 of Bandy-344 cannot be modified 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. Ex. 2001, ¶188. I disagree with this argument.

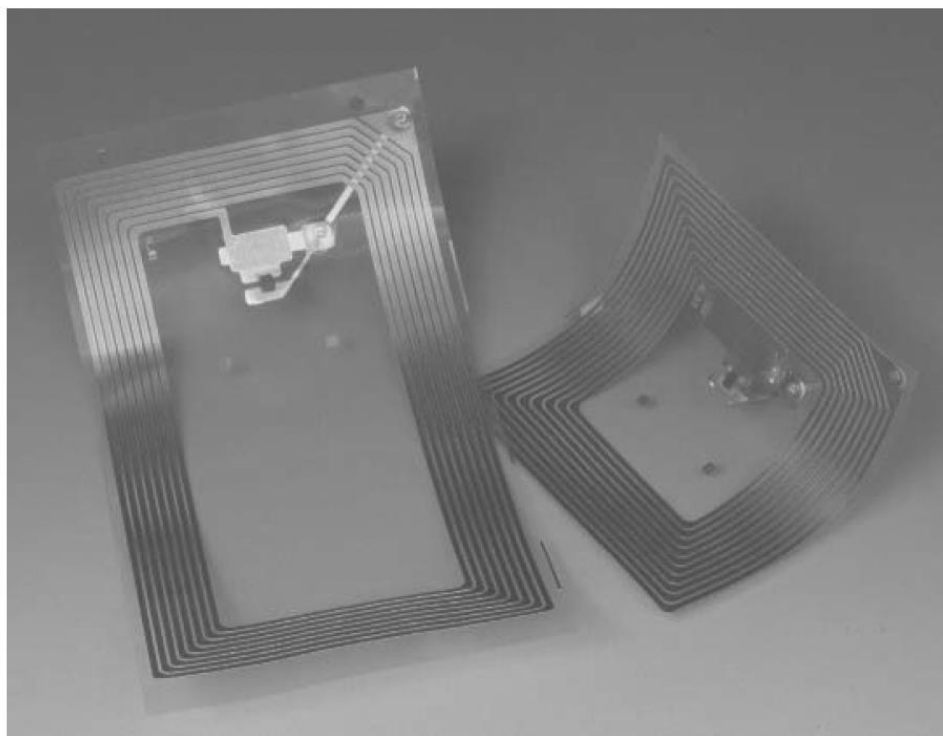
31. I have considered the paper “An introduction to RFID technology” (Ex. 1028) published in 2006, cited in Ex. 2006. This document discloses RFID tags based on near-field coupling including “a 13.56 MHz Tiris tag (www.ti.com/rfid), which has a laminar plastic substrate (approximately 5×5 cm) with adhesive for easy attachment to goods.” Ex. 1028, at 4. This document discloses a small and flexible NFC antenna for HF RFID purposes.



Ex. 1028, at 4 (FIG. 2).

32. I have further considered the book “RFID Handbook” by Klaus Finkenzeller from 2003 (Ex. 1029), also cited in Ex. 2006. This book discloses “[a] smart label primarily consists of a thin paper or plastic foil onto which the transponder coil and transponder chip can be applied” that is flexible and bended. See Ex. 1029, FIG. 2.15. In addition, this book noted that “[a]t least 90% of all RFID systems currently

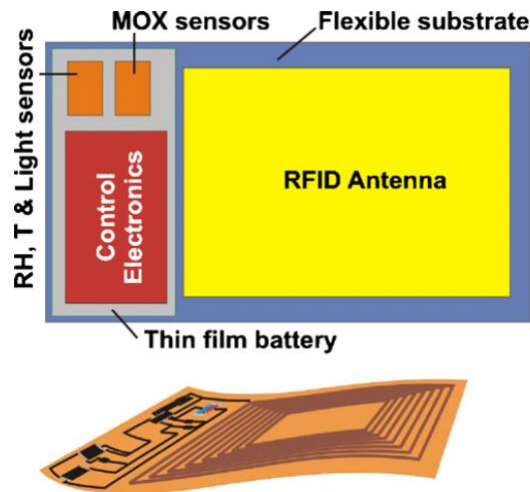
sold are inductively coupled systems” at the time...These also include proximity coupling (ISO 14443, *contactless smart cards*) and *vicinity coupling systems* (ISO 15693, *smart label* and contactless smart cards). Frequencies below 135 kHz or 13.56 MHz are used as transmission frequencies.” (emphasis in original). Ex. 1029, at 42. Dr. Surati has noted ISO 15693 as a standard applied to HF RFID readers. See Ex. 2001, ¶ 58 (citing Ex. 2010). Therefore, this book discloses a flexible vicinity coupling smart label for HF RFID purposes.



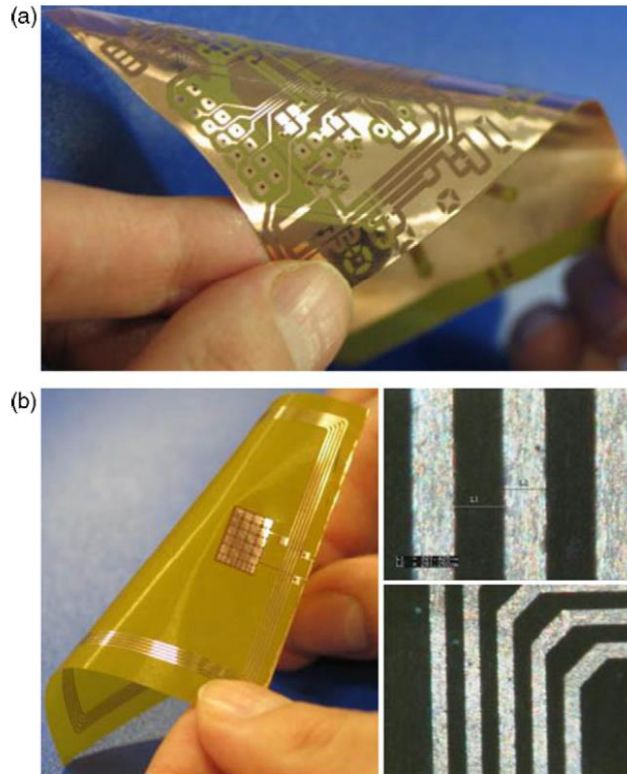
Ex. 1029, at 40 (FIG. 2.15).

33. Further, I have considered a paper titled “Flexible tag microlab development: Gas sensors integration in RFID flexible tags for food logistic” available from 2007 (Ex. 1030). This paper discloses flexible RFID 13.56MHz tags in compliance with

ISO 15693, which again is the standard Dr. Surati cited as applied to HF RFID readers. See Ex. 1030, at 1 (“RFID technology in the 13.56 MHz band was chose since it is the best compromise for integration on a flexible tag”); Ex. 2001, ¶ 58. In addition, the paper “A Semina Report on Near Field Communication” from 2009 (Ex. 2010), which Dr. Surati referenced in his report (*e.g.* Ex. 2001, ¶4), discloses that NFC and RFID share the same working standards, and NFC is compatible to RFID. Ex. 2010, at 9. Therefore, it is my opinion that the flexible RFID 13.56MHz tags from Ex. 1030 are compatible with NFC use.



Ex. 1030, at 2 (FIG. 1).



Ex. 1030, at 2 (FIG. 3).

34. I have also considered some other references discussed in Ex. 2025 that discloses NFC antenna arranged on flat and flexible printed circuit board. *See* Ex. 1025, at 3 (disclosing NFC antenna comprises a flexible substrate and an antenna circuit); Ex. 1027, [0003] (disclosing NFC antenna adopts a flexible circuit board); Ex. 1022, 6:31-32 (disclosing near field antenna on flexible printed circuit board).

35. Thus, it is my opinion that implementing NFC antenna for HF RFID purposes would not increase the size of an RFID tag nor stiffen the tag at the time of invention of the '340' patent.

36. Dr. Surati further argues that “[b]ecause the tags in Bandy are intended to be attached directly to items, a POSITA would not have considered NFC for several reasons” such as the bulkiness of NFC tags and the limitation of NFC tags in certain environments (for example, in the vicinity of metal or liquid). Ex. 2001, ¶189. I disagree with this argument.

37. To the extent that Dr. Surati objects to the applicability of NFC tags to Bandy on the basis of bulkiness, I have considered references that disclose otherwise. For example, the ’722 patent (Ex. 1022, filed in 2007) discloses that “[a] near field antenna may be formed in a planar arrangement using a thin substrate such as a flex circuit substrate. A flex circuit substrate may be, for example, 0.01 to 1 mm thick...A typical antenna thickness may be about 0.08 mm.” Ex. 1022, 3:39-46. This is manifested by Figure 2 of Ex. 1028 (published in 2006), Figure 2.15 of Ex. 1029 (published in 2003), and Figures 1 and 3 of Ex. 1030 (published in 2007), all of which I have discussed above. Therefore, it is my opinion that an NFC antenna at the earliest priority date of ’340 Patent (April 11, 2012) is not bulky as compared to antennas that support longer reading ranges, such as UHF RFID antennas.

38. In addition, I disagree with Dr. Surati’s opinion that NFC antennas are not suitable for use in the vicinity of metal or liquid. To begin with, Dr. Surati does not rule out the use of NFC tags near metal or liquid, but states that special material or distance between the antenna and the metal or liquid can allow the NFC tags to work

in such environment. Ex. 2001, ¶67. Further, Dr. Surati relies on Ex. 2006 to argue that metal and liquid adversely affect RFID (presumably he means HF RFID) but UHF or LF tags can operate on metal or liquids. Ex. 2001, ¶ 90. However, his summary is contrary to the teaching of Ex. 2006. Instead, this paper discloses that “[t]his interference by water is more pronounced for RFID operating at *microwave* frequency range. Therefore, RFID systems operating at low frequency (9 to 135 kHz) range should be used for such applications.” Ex. 2006, at R105. Therefore, contrary to Dr. Surati’s summary, Ex. 2006 explicitly discloses that an UHF RFID tag that operates at microwave frequency range is less suitable for use in the vicinity of liquid. Further, Ex. 2006 disclosed the use of RFID 13.56MHz tags in the vicinity of wine, Ex. 2006, at R104, which clearly shows the suitability of NFC/HF RFID (13.56MHz) tags in the vicinity of liquids.

39. In addition, with regard to metal, the ’722 Patent discloses that “[f]errite elements such as adhesive-backed ferrite tape (e.g., ferrite tape of about 0.8 mm thickness) may be used to reduce signal losses due to the electromagnetic field interactions between the near field antenna’s electromagnetic fields and conductive material such as the conductive exterior surface of the computer monitor. With one suitable arrangement, a strip of ferrite tape may be placed immediately in front of an antenna to shield the antenna from a conductive housing wall.” Ex. 1022, 3:27-34. Similarly, a paper titled “Antenna design guide for MFR 52x, PN51x and PN53x”

from 2010 (Ex. 1031) discloses the use of ferrite shielding to shield a NFC antenna from metal. Ex. 1031, at 8.

40. Therefore, in my opinion, Dr. Surati's opinion that NFC antennas are not suitable for use in the vicinity of metal or liquid is not compatible with the POSITA's knowledge at the earliest priority date of the '340 Patent (April 11, 2012, which Dr. Surati uses as the reference point for evaluating a POSITA's knowledge, *see* Ex. 2001, ¶24).

41. It is my opinion that, contrary to Dr. Surati's opinion, a POSITA would have recognized that the antennas disclosed in Bandy-344 are compatible with NFC.