

IPR2024-00728
Patent No. 7,151,430 B2

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,

Petitioner

v.

TELEFONAKTIEBOLAGET L M ERICSSON (publ),

Patent Owner.

Case No. IPR2024-00728

Patent No. 7,151,430 B2

Before Daveina B. Williams, *Trial Paralegal*

**SUPPLEMENTAL EXPERT DECLARATION OF
PAUL R. PRUCNAL, Ph.D.**

ERICSSON EXHIBIT 2009

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I, Paul R. Prucnal, under the penalties of perjury, depose and state:

A. Introduction, Qualification, and Assignment

1. I have been retained as an expert in this inter partes review (“IPR”) by counsel for TELEFONAKTIEBOLAGET L M ERICSSON (“Ericsson”) to provide my opinions in connection with U.S. Patent No. 7,151,430 (the “’430 Patent”).

2. I prepared and submitted my Expert Rebuttal Declaration of Paul R. Prucnal Regarding Validity of U.S. Patent NO. 7,151,430 (the “First Prucnal Declaration”) in support of Ericsson’s Preliminary response. EX2002. I incorporate that First Declaration herein by reference. Since that First Declaration, my qualifications and compensation have not changed.

3. After I signed my First Declaration, I understand the Petitioner, Intel Corporation, submitted additional argument and evidence in its Reply (PAPER 8) and the Board issued its Institution Decision (PAPER 10).

4. The purpose of this Supplemental Declaration is to address developments in this proceeding since my First Declaration. This Supplemental Declaration does not restate my opinions and analyses in my First Declaration. Rather, it supplements my prior work.

B. Legal Standards

5. I understand that a petitioner must articulate a reason why a person of

ordinary skill in the art would have combined or modified the prior art references. I also understand that in determining whether there would have been a motivation to combine prior art references to arrive at the claimed invention, it is insufficient to simply conclude the combination would have been obvious without identifying any reason why a person of skill in the art would have made the combination. I understand that obviousness concerns whether a skilled artisan not only could have made, but would have been motivated to make, the combinations or modifications of prior art to arrive at the claimed invention.

C. Foundational Information

6. In preparing this Supplemental Declaration, in addition to the material described in my First Declaration, I reviewed and considered the following:

- a. PAPER 8 Intel's Reply
- b. PAPER 9 Ericsson's Sur-Reply
- c. PAPER 10 Decision to institute
- d. EX2010 Deposition Transcript of Manos Tentzeris

D. Supplemental Opinions Regard Level of Ordinary Skill

7. After considering Intel's Reply (Paper 8) and the Institution Decision (Paper 10), I concluded that my prior opinions regarding the level of ordinary skill in the art should be refined. The proper description of the level or ordinary skill in the art relative to the '430 Patent would have a bachelor's degree in electrical

engineering, physics, or a similar discipline, and either a master's degree in one of these fields of study or a minimum of two years of experience designing integrated radiofrequency circuits and inductors for semiconductors.

8. My opinion is based on part on the Declaration of Manos Tentzeris (EX1003) that states: In my opinion, a POSITA at the time of the alleged invention of the '430 patent would have had at least a master's degree in electrical engineering, physics, or a similar discipline and at least two years of experience in designing integrated circuits or inductors or a bachelor's degree in electrical engineering, physics, or a similar discipline and at least four years of experience in *designing integrated circuits* or inductors. Additional education might compensate for less experience and vice versa." EX1003, ¶ 58. (Italics added)

9. In its Reply, Intel argued the field was inductor design. PAPER 8, 1-2. Intel then argued the '430 Patent addresses the problem of "efficient circuit design." *Id.*, 4. Efficient circuit design is a far broader field than inductors for semiconductor chips or integrated circuits. Intel's arguments do not align with Dr. Tentzeris' description of a POSITA in which he focused on designing integrated circuits or inductors. The Board originally stated that the field of endeavor is "inductor design." PAPER 10, 17.

10. After further evaluating the references relied on by Intel and the Board's Institution Decision (PAPER 8), I conclude that applications for printed

circuit boards (“PCBs”) differ from integrated circuits or semiconductors and that broadly characterizing the field “efficient circuit design” is incorrect for evaluating the prior art. Rather, the field should be limited to integrated circuits or inductors for semiconductors.

E. Claim Construction

11. The ‘430 Patent states it is directed to reducing mutual electromagnetic (“EM”) coupling between a first inductor and a second inductor on a single semiconductor die. EX1001, 10:61-63. The preamble to Claim 11 states: “A method of reducing mutual electromagnetic coupling between a first inductor and a second inductor on a semiconductor die, comprising:” A POSITA would have recognized the phrase “semiconductor die” modifies the “first inductor” and “the second inductor” and requires both inductors to be formed on a single semiconductor die. A POSITA would not read the preamble of claim 11 as requiring, for example, only the second inductor to be formed on the semiconductor die. If the first and second inductors are not both formed on a single semiconductor die, a POSITA would not be able to evaluate their relative positions and orientations.

12. The specification supports this construction. It describes an “inductor design for reducing mutual EM coupling between VCO resonators and a method of implementing the same on a single semiconductor die.” EX1001,1:59-61. It

describes the invention as forming the first and second inductors on a semiconductor die. Id., 2:13-24. The disclosed simulations used a typical semiconductor substrate. Id. 5:45-47. The preamble of claim 11 differs from the preamble of independent claim 1 and disclaimed independent claim 21. Id., 10:11-12 & 12:16. Therefore, it is limiting and also applies to claims 12-19 that depend from claim 11.

13. Two inductors that are on the same chip must be formed and positioned and supplied with current in a way that results in a reduced electromagnetic field and minimizes magnetic field contributions.

14. The language used in the other patent claims informs a POSITA that the fabrication method of claim 11 is limited to forming both inductors on a semiconductor die.

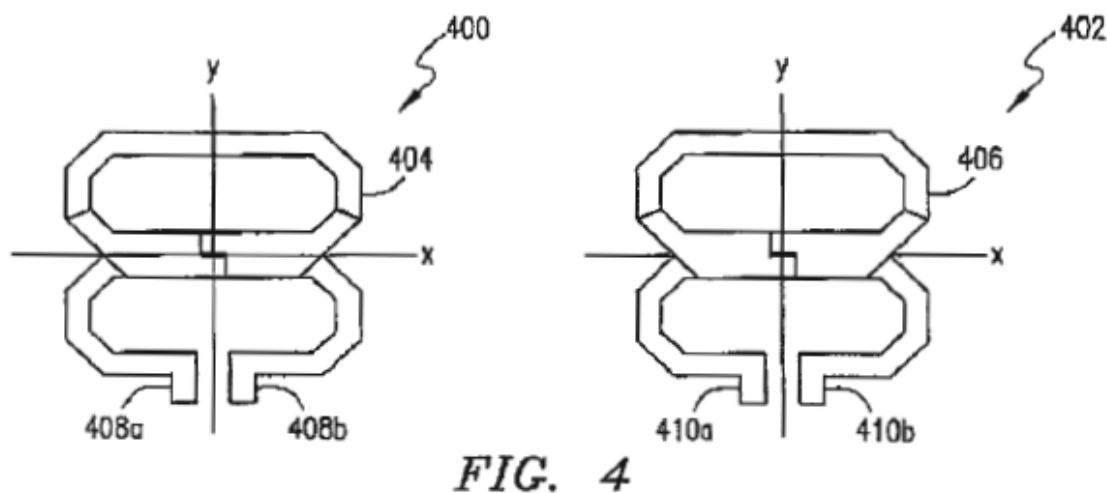
15. The term “far field” has been construed to mean “the electromagnetic field at a certain distance from the first inductor (where the second inductor is positioned)” EX1020, p. 19, EX1001, 3:6-10.

F. The ‘430 Patent

16. The ‘430 Patent relates to inductors implemented within a semiconductor chip. EX1001, Abstract. The ‘430 Patent utilizes an inductor design that is symmetrical about at least one axis and contains at least one pair of loops (e.g., a figure-eight-shape) arranged so that the magnetic fields emanating from

each of the loops tend to cancel each other out. *Id.* Abstract, 1:61-66, 2:3-5. This configuration results in a reduced electromagnetic field at a certain distance from the inductor, thereby lowering the electromagnetic coupling between this inductor and other circuit components on the same chip. *Id.*, at 1:65-2:2. The design of the ‘430 Patent reduces the amount of undesired coupling with the inductor, which may result in spurious receiver responses and unwanted frequencies in the transmit spectrum. *Id.*

17. The horizontal and vertical axes X and Y in Figure 4 (below) and the electromagnetic data shown in Figures 6, 8, and 12 (below in ¶ 21) show the main factor in reducing the EM interference between the two inductors is the lateral distance between the X, Y center points of the two inductors (the “center distance” in Figs. 6, 8, & 12).



EX1001, Figs. 4, 6, 8, & 12. The point of Taniguchi is to make the two inductors concentric, which means the distance (as understood by reference to Figures 6, 8,

and 12) is zero between the center points of any concentric inductors in Taniguchi. In contrast, the “predetermined distance” language in the independent claims focuses on the lateral distance between the center points of the two inductors.

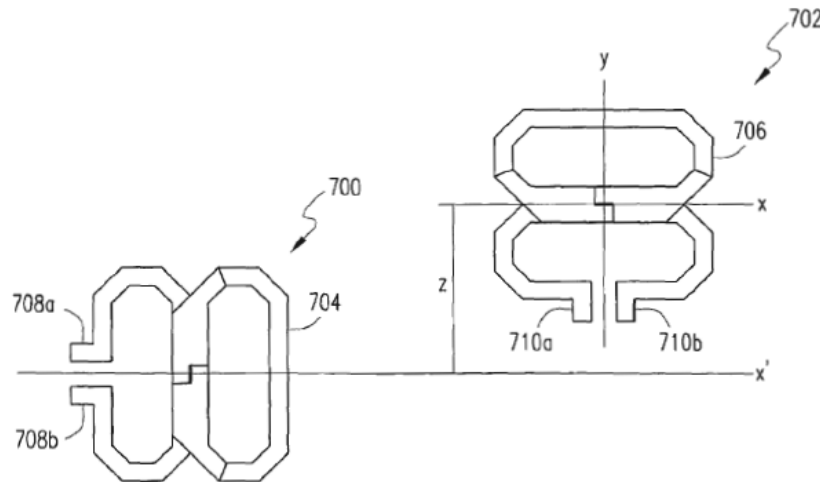


FIG. 7

18. The magnetic field needs to be at a far field distance to be sure it is uniform, not because it needs to be a propagating EM wave. “...significantly reduced far field at a certain distance from the inductor coil...”. EX1001, 4:20. This is the distance where the fields become equal and opposite. This does not relate to conventional definition of far field but relates to having uniformly symmetric field lines that cancel. The ‘430 describes “reducing EM coupling” and causing “the resulting magnetic field components...to cancel each other by virtue of symmetry” EX1001, 1:42-65.

G. Taniguchi

19. Taniguchi discloses a radio guidance antenna in which the sum of mutual inductances of antennas is minimized. EX1005, Abstract. Taniguchi does not state or suggest that its teachings can be applied to integrated circuits as in the '430 Patent (EX1001) or Rostoker (EX1006). Taniguchi teaches the antennas are formed on a printed circuit board. EX1005, [0065].

20. Taniguchi discloses that the antennas 1 and 2 must be positioned concentrically to achieve minimize the mutual inductance of antenna 1 on antenna 2. EX1005, Figs. 3, 4, 6A-6E, 7A-7D, 8A-8E, 9, 10A-10E. Dr. Tentzeris confirms the requirement for the antennas 1, 2 and be arranged concentrically. EX1003, ¶¶ 107, 163 (“As I discuss below, this concentric arrangement is necessary to achieve zero mutual inductance between the antennas.”), 166, 184-5, & 190.

21. Taniguchi does not state or disclose inductors having center distances positioned at a distance or off different axes as shown in Figs. 4 & 7 (above) and Figs. 6, 8, & 12 (below), all of which reduced coupling as the “center distance” increases.

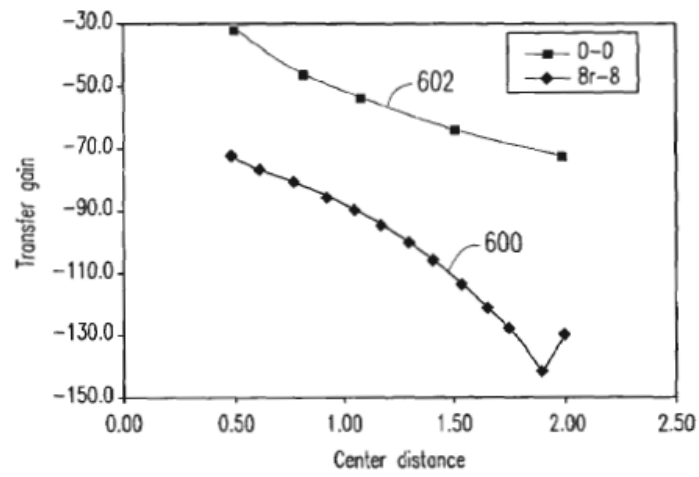


FIG. 6

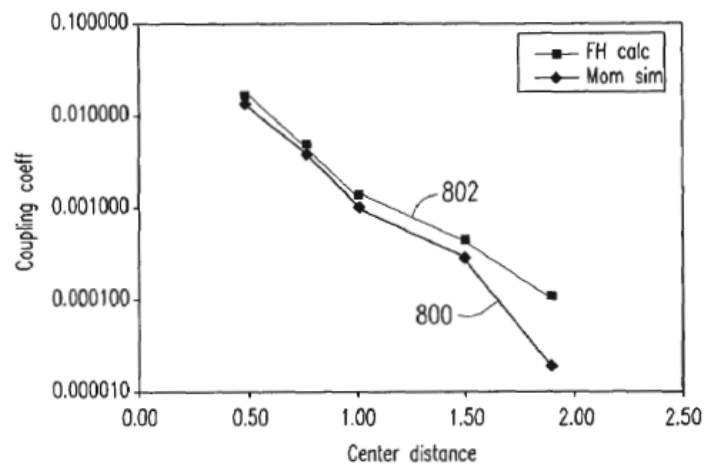


FIG. 8

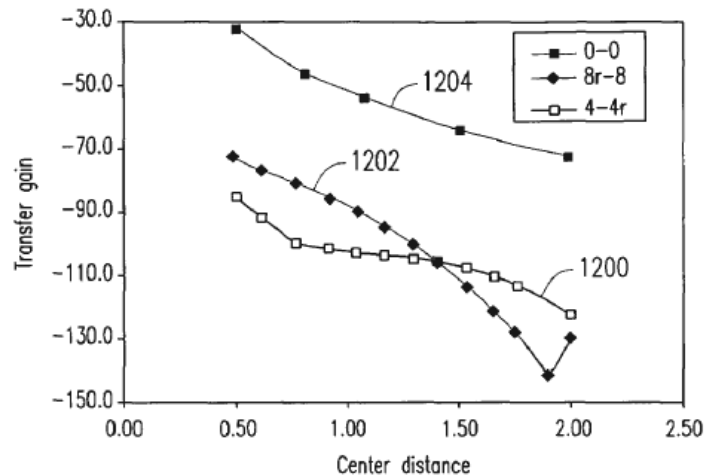


FIG. 12

22. Taniguchi teaches the opposite, which is the antenna must be positioned concentrically to achieve the greatest reduction in coupling. The “mutual electromagnetic coupling between the first inductor and the second inductor” is not reduced “as a result of Taniguchi’s first antenna having a reduced electromagnetic field” as recited in claims 1 and 11 of the ‘430 Patent. In Taniguchi, antenna 1 has a strong, not reduced, magnetic field at antenna 2. EX1005, [0011] The reduced electromagnetic coupling between the first and second antennas is due to the strong magnetic field of the first antenna inducing opposing currents in the second antenna. *Id.* [0015] The second antenna also induces opposing currents in the first antenna, so the reduced electromagnetic field also is not reduced as a result of the second antenna having a reduced electromagnetic field. *Id.*

23. In Taniguchi, the second antenna 2 is not in the far field of the first antenna 1, which, in the traditional definition of far field, is much larger than a wavelength. Rather, in Taniguchi, antenna 2 is not in the far field because it is much closer than a wavelength. As defined by the claim construction for far field, Taniguchi's second antenna 2 is not far enough away from antenna 1 to have uniform field lines that cancel. Referring to Taniguchi Fig. 3, because the second antenna is not in the far field, the magnetic fields from the two halves of the first antenna do not overlap uniformly and cancel. Rather, they induce opposite currents in two separate parts of the second antenna. Id. [0057-58] and Figs. 3 & 4 (shown below).

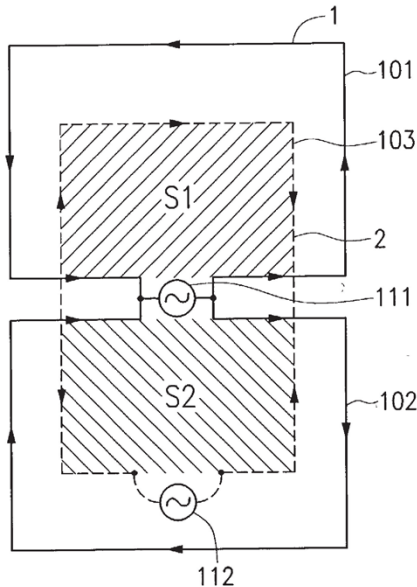


FIG. 3

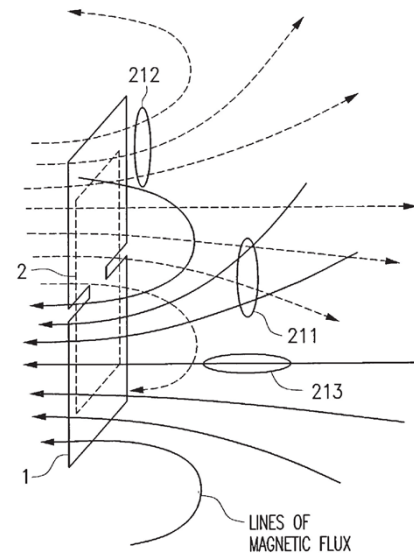


FIG. 4

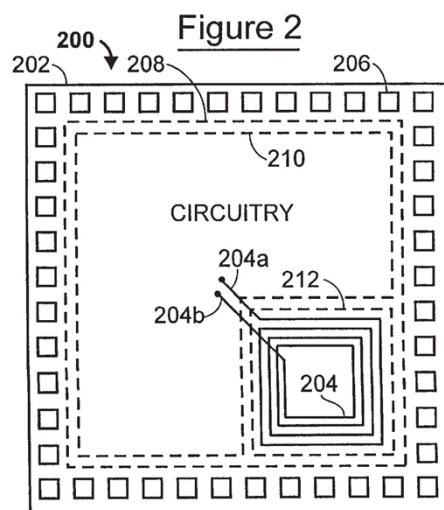
H. Rostoker

24. Rostoker is directed to on-chip antennas and systems for utilizing the

same. EX1006. One or more antennas are formed on an integrated circuit (IC) chip. Id., Abstract, 1:5-7. Rostoker does not state that its teachings regarding antennas are suitable for use as inductors on a PCB. Rostoker does not discuss the problem of mutual magnetic coupling of inductors. Rostoker does not discuss the problem of coupling between antennas in a non-contact communication system.

25. A POSITA would not have found motivation to combine Taniguchi's PCB teachings with Rostoker's IC teachings to arrive at the subject matter of the Challenged Claims, *i.e.*, inductor layouts on semiconductor chips having reduced mutual coupling.

26. The terminals in Rostoker Figure 2 (shown below) are in a spiral, which does not have the required geometry to create the counter propagating magnetic fields required by the '430 Patent.



But even if Rostoker's spiral was 8-shaped, one of Rostoker's endpoints would be internal to the loops and would need to be brought outside by terminal 204b.

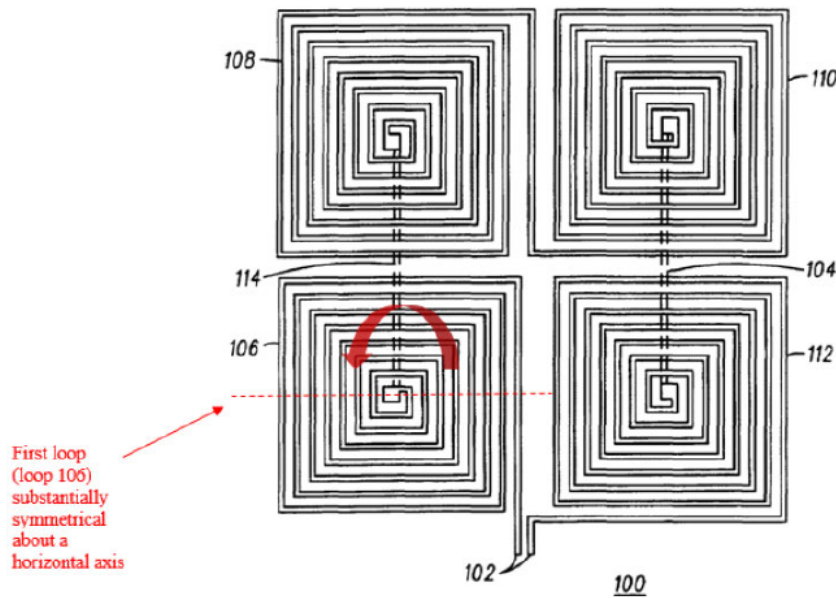
Terminals 204a and 204b are not symmetric, and even if their endpoints are close together, the magnetic fields would not cancel.

I. Midya

27. Midya is directed to a planar magnetic field inductor having at least three planar loops/spiral conductor coils. EX1007, Abstract. Midya states its teachings are typically located on a printed circuit board. *Id.*, at 13-14, & 20. Midya does not state that its teachings apply equally to inductors in IC chips.

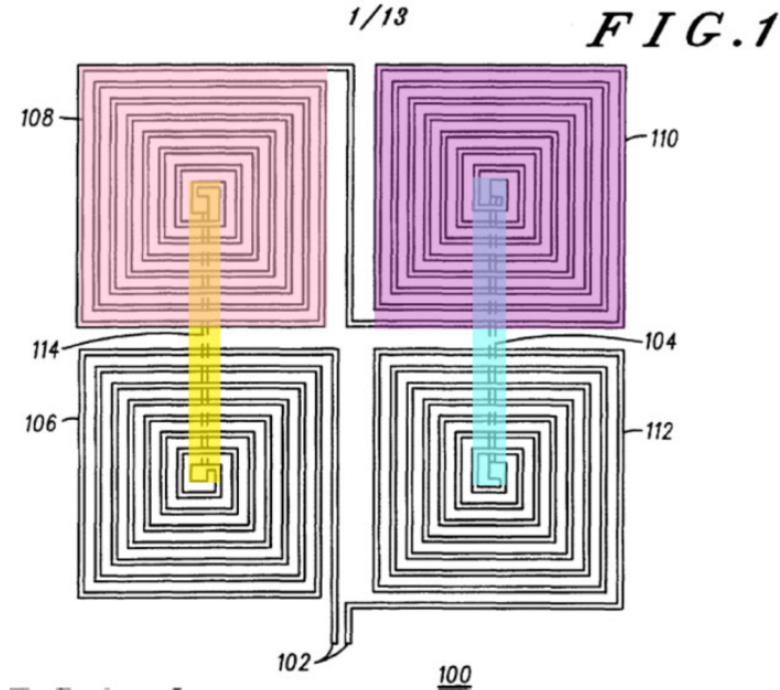
28. Midya's FIG. 1 shows electrical current is supplied to the four loops 106, 108, 110, and 112 by a combination of terminals, wires, and crossovers that are spaced far apart, and which create an "additional loop," which is what the claim recitations ("two closely spaced terminals connected to the first loop" and "connecting two closely spaced terminals to the first loop,") of claims 1 and 11 of the '430 Patent are intended to prevent. EX2002, ¶ 122. The additional loop generates an EM field that is not reduced or cancelled by any structure in Midya.

29. As seen in Figure 1 of Midya, none of the loops (106, 108, 110, 112) are substantially symmetrical about a first predefined axis at least because the windings are formed in such a manner that if you folded any one loop over the axis, one half would not match the other. This is evident by the spiral nature disclosed in Midya, reproduced below. Fig. 1 is not symmetrical because there is a crossover on one side but not the other.



Midya at Fig. 1 (annotated).

30. Midya fails to disclose “two closely spaced terminals connected to the first loop for supplying electrical current to the first and second loops while minimizing magnetic field contributions from the terminals,” as required by claims 1 and 11. The first and second loops are connected via connections throughout the entire inductor structure. While this may mean the two loops are arguably connected to one another, it shows how intricate and particular the connections are with respect to this inductor. I again show crossover 104 in blue, loop 110 in purple, loop 108 in pink, and crossover 114 in yellow. This same issue applies to the two terminals, which are not galvanically connected to the first loop. Indeed, to the extent that the connection is electrically connected through the second loop, the crossover and additional loops 108 and 110, that creates an additional loop, which the '430 Patent explicitly teaches against.



31. Midya does not disclose “a second inductor positioned at a predetermined distance from the first inductor. First, this concentric inductor is on another layer of the IC. Second, because the so called second inductor is concentrically located above the first, it is not at a predetermined distance, e.g., it is not at a certain distance on the X or Y axis. A POSITA would understand that these teachings of Midya do not disclose or render obvious this limitation.

32. The reason for putting the inductor typically in the top layer on a chip is generally that the metal layers on a Wi-Fi chip have different thickness and may also be made of different metals. The top layer is generally thicker so that it has lower resistance, and the q factor will improve as also discussed in the ‘430 Patent.

EX1001, 3:45-49.

J. Raghavan

33. Raghavan is directed to inductors used on IC. EX1008, [0002].

Raghavan does not state that its IC teachings apply equally to the field of PCBs that is the field of Midya. Raghavan does not disclose 8-shaped or clover shaped inductors. Raghavan does not discuss reducing magnetic coupling between inductors.

34. In Raghavan, the configuration and function of the symmetric spiral inductors shown in FIGS. 2 and 3, are respectively formed from concentric circles or square windings, and differ materially from the configuration and function of the inductors claimed in the '430 Patent. EX2002, ¶ 102. These spiral inductors have only a single "loop" with circular or square windings that are configured for "eliminating signal degradation due to inductor asymmetry." *Id.*; EX1008, [0018] & [0021]. Raghavan's inductors avoid the asymmetry of conventional spirals by using crossovers and concentric loops such that the current travels only in one direction as it traverses the inductor from the input to the output terminal (a clockwise or counter-clockwise direction but not both). Raghavan's inductor cannot produce counter-propagating magnetic fields that cancel, as required by the '430 patent. Raghavan does not discuss mutual EM coupling between two inductors and does not attempt to reduce the EM field at a certain distance from one inductor.

35. For the foregoing reasons, a POSITA would not have been motivated to combine Midya and Raghavan.

K. Brooks

36. A POSITA designing a semiconductor chip would have been motivated to follow the CMOS layout design rules, which were expressly for ICs, rather than the teachings of Brooks, which were for printed circuit boards.

L. Ground 1: Taniguchi

37. Taniguchi solves the problem of too little magnetic coupling to an RFID tag arising from too much magnetic coupling between concentric overlapping antennas 1 and 2. EX1005, [0016] In Taniguchi, antenna 2 is not in the far field of antenna 1, so any reduced coupling does not result from cancelling magnetic fields, but by inducing counter-propagating currents in two sections of antenna 2. The purpose is not to reduce interference between the antennas, but to prevent antenna 2 from siphoning power from antenna 1. The coupling from the antennas 1, 2 to the RFID tag is in the near field and is desirable for it to be strong, not reduced.

38. Taniguchi is directed to antennas for PCBs. EX1005, [0068]. Taniguchi does not explain that its teachings apply equally or at all to semiconductors. Conversely, the '430 Patent is focused on inductors for semiconductors but does not state that its teachings apply equally to PCBs.

EX1001, 1:59-61.

39. On reading Taniguchi, a POSITA would be led in a direction divergent from the path taken in the '430 Patent. Taniguchi requires the antennas to be positioned concentrically, *i.e.*, their centers are not at a distance from each other. That would lead a POSITA away from the '430 Patent's teachings of positioning the two inductors adjacent one another on the same plane where the centers of the inductors are at distance from each other. A POSITA would not have been motivated to position the first and second inductors concentrically.

40. In paragraphs 27-28 of my earlier Declaration (EX2002), I stated Taniguchi focuses on solving the problem of too little mutual magnetic coupling between antennas for large, radio guidance antennas for antitheft systems. More specifically, Taniguchi addresses too little near field coupling from antennas to an RFID tag caused by antennas siphoning power from each other and reducing that siphoning by inducing counter propagating currents in the second antenna. EX1005, [0016]. The objective is that together, the two antennas generate the strongest magnetic field for sensing.

41. Regarding Taniguchi (EX1005), the "mutual electromagnetic coupling between the first inductor and the second inductor" is not reduced "as a result of Taniguchi's first antenna having a reduced electromagnetic field" as recited in claims 1 and 11. The first antenna does not have a reduced magnetic

field at Taniguchi's second antenna. The first antenna has a strong magnetic field at the second antenna. The reduced EM coupling between the first and second antennas is due to the strong magnetic field of the first antenna inducing opposing currents in the second antenna. The second antenna also induces opposing currents in the first antenna, so the reduced EM field also is not reduced as a result of the second antenna having a reduced electromagnetic field. Reducing mutual inductance means the induced currents are opposite, not that the magnetic fields cancel. EX1005, [0014-0015]. Taniguchi reduces the inductance coupling between antennas 1 and 2 in order to increase coupling with RFID tags 211-213. EX1005, Fig. 4.

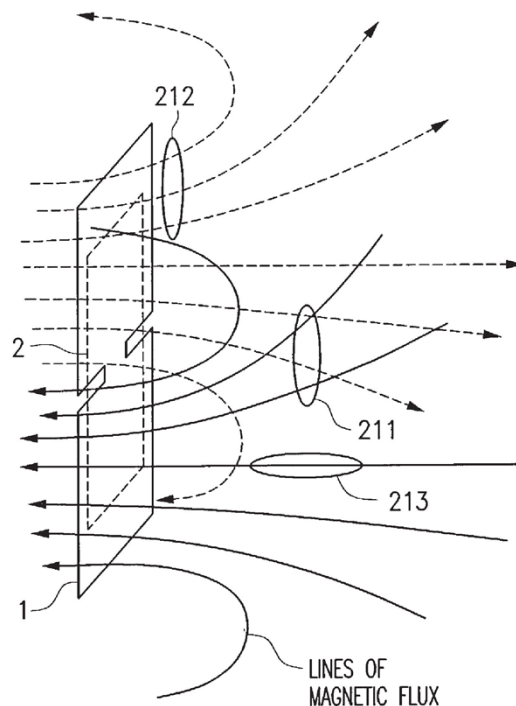


FIG. 4

42. Referring to EX2002, ¶ 79, “far enough away” means the magnetic field lines become uniform and cancel each other. Taniguchi does not position the second antenna at a distance far enough away so that the magnetic field lines are uniform and cancel the fields. Rather, Taniguchi has the antennas close enough together so that the top and bottom loops of the first antenna generate counter propagating currents in different sections of the second antenna, cancelling the currents, not cancelling the magnetic field. EX1005, Fig. 5.

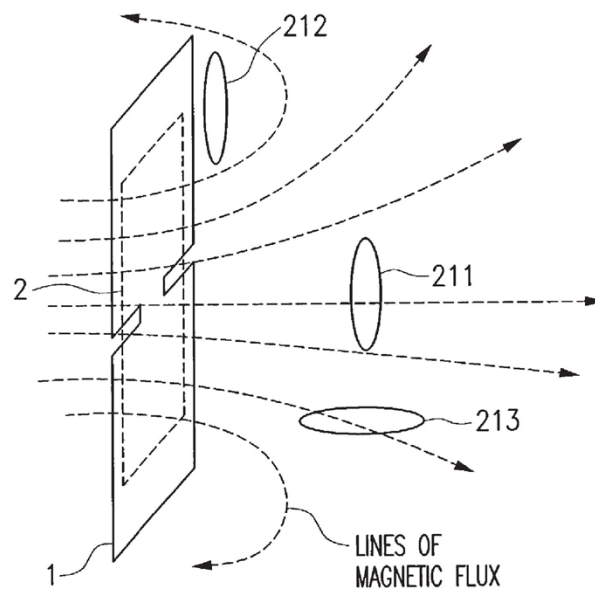


FIG. 5

43. The ‘430 Patent states: “A method and system involve using inductors that are substantially symmetrical about their horizontal and/or their vertical axes and providing current to the inductors in a way so that the resulting magnetic field

components tend to cancel each other by virtue of the symmetry. EX1001: 1:61-66.

It continues: “In addition, two such inductors may be placed near each other and oriented in a way so that the induced current in the second inductor due to the magnetic field originating from the first inductor is significantly reduced.”

EX1001, 1:66-2:2. This distinguishes canceling magnetic field components from reducing induced currents. The ‘430 orients the inductors to reduce the induced currents, but Taniguchi orients the antennas to cause induced currents in the second antenna.

44. The ‘430 also describes “an inductor having a reduced far field” where “the second loop is arranged such that a magnetic field emanating therefrom tends to cancel a magnetic field emanating from the first loop.” EX1001, 2:6-12. The ‘430 Patent states: “The inductor design and method serve to reduce the EM field at a certain distance from the inductor (*i.e.*, the far field)”. EX1001, 3:6-8. “This reduced far field may then be used to reduce the mutual coupling between two inductors.” EX1001, 3:11-13. But this all appears to be near field behavior because it doesn’t describe a propagating EM wave, just a magnetic field. The difference between inductive coupling and antenna interference in the far field is that mutual inductance is magnetic only (then inducing a current) versus receiving a propagating EM wave.

45. The ‘430 Patent continues: “Choosing a substantially symmetrical

shape (*e.g.*, a figure-8 or a four-leaf clover shape) for the first inductor helps reduce the EM field at far distances. This will, in turn, reduce mutual EM coupling to the second inductor, regardless of its shape.” EX1001, 3:19-23. That passage describes reducing the far field, which in turn reduces the mutual coupling. Canceling the magnetic field reduces the current coupling into the other inductor.

46. According to the ‘430 Patent: “Consequently, the inductor 200 has been found to have a significantly reduced far field at a certain distance from the inductor coil 202.” EX1001: 4:19-21. This is the distance where the fields become equal and opposite. This does not relate to conventional definition of far field but relates to having uniformly symmetric field lines that cancel.

47. The ‘430 Patent teaches “the 8-shaped inductors (plot 600) resulted in much lower mutual coupling relative to the O-shaped inductors (plot 602). In addition, the 8-shaped inductors show a degree of resonant behavior where the mutual coupling is very low at a certain distance (depending on the frequency).” EX1001, 7:26-31. The benefit of the 8-shaped inductors compared to the O-shaped inductor increases proportionally with the distance as seen by the greater separation between the curves.

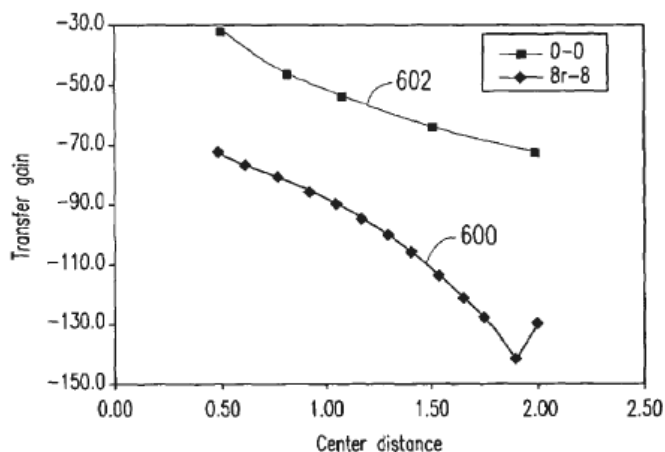


FIG. 6

48. Taniguchi's antenna's magnetic field is not cancelled, as in the '430 Patent, by having two identical but opposite fields superimposed in the far field. Taniguchi's second antenna is not located in the far field, but is immediately adjacent, concentric, and overlapping with the first antenna. See e.g., EX1005, Figs. 7A-D. Taniguchi has no cancellation of the magnetic field whatsoever; rather, the first antenna induces opposing currents in the second antenna, canceling the currents, not the magnetic field. As shown in Fig. 9 (below), Taniguchi induces opposing currents in different regions of the second antenna, S1, S2, S, S4, which shows that Taniguchi does not have a cancelled magnetic field, but two separate magnetic fields acting independently to induce opposing currents in different parts of antenna 2.

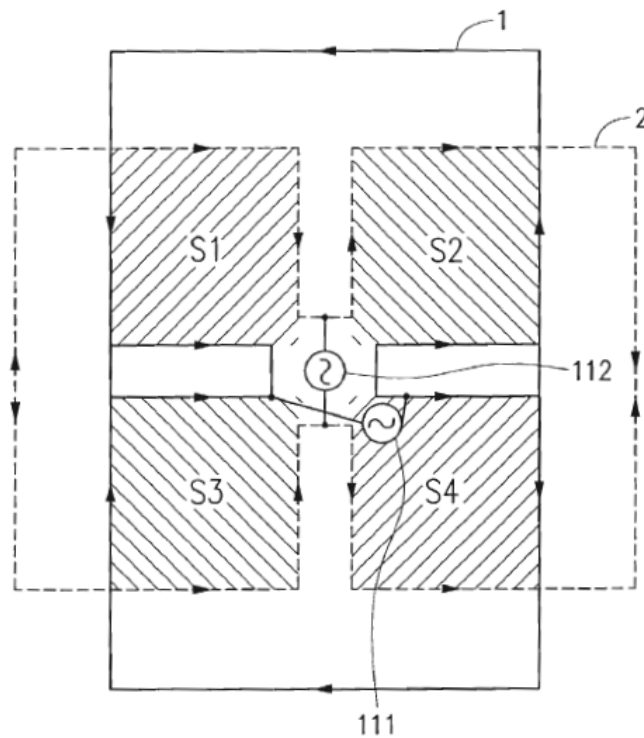


FIG. 9

Furthermore, the purpose of Taniguchi is not to cancel the magnetic field of the first antenna. Taniguchi's magnetic field is required for sensing the RFID, so Taniguchi tries to strengthen the magnetic field, not lessen it. Taniguchi does this by causing the second antenna to not pull energy out of the first antenna.

49. Taniguchi does not disclose or render obvious the first and second inductors on a semiconductor having reduced EM coupling between them as claim 11's preamble requires. Taniguchi does not disclose or render obvious "forming the first inductor to reduce a far field, said step of forming the first conductor comprising: forming a first loop having a shape that is substantially symmetrical about a first predefined access; forming a second loop having a size and

substantially identical to the first loop; orienting the second loop in relation to the first loop such that a magnetic field emanating from the second loop tends to cancel a magnetic field emanating from the first loop”.

50. The ‘430 Patent teaches attenuating EM as the center distance between the two inductors increases. A POSITA would not have looked to Taniguchi’s concentrically arranged antennas when positioning inductors on a semiconductor die. It would be difficult, if not impossible, to make two inductors from different circuits at different locations on the semiconductor chip concentric with one another. Even if a POSITA could make the inductors concentric, the POSITA would have been unable to drive the two inductors as Taniguchi drives his antennas 1 and 2 to reduce coupling between the inductors because the inductors are each a component of a different circuit that, due to the function of the circuit (*e.g.*, VCO), would drive its inductor differently than taught by Taniguchi. The inductors in the ‘430 patent necessarily need to be spaced from one another and cannot be concentric.

51. Taniguchi does not disclose or render obvious “connecting two closely spaced terminals to the first loop for supplying electrical current to the first and second loops while minimizing magnetic field contributions from the terminals.”

52. Taniguchi does not teach or disclose all the elements of independent

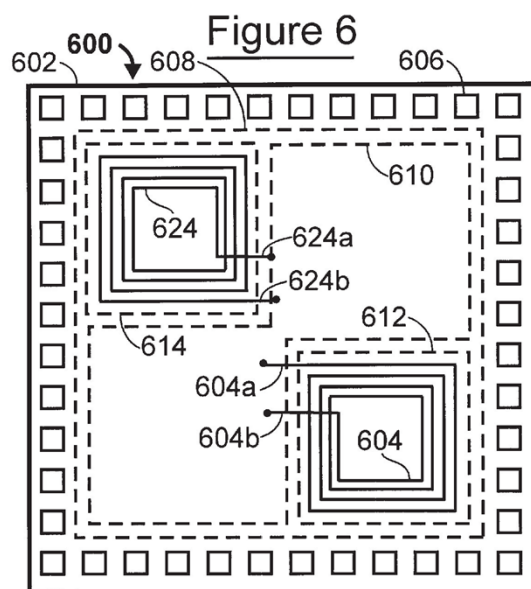
claims 1 or 11, and they would not have been obvious to a POSITA at the time of the invention.

M. Ground 2: Taniguchi and Rostoker

53. Intel argues that Rostoker discloses the preamble limitation on a semiconductor die missing from Taniguchi. PAPER 2, at 60. Rostoker does not teach or disclose the first and second inductors formed on a single semiconductor die as claim 11 requires. Rostoker does not overcome the deficiencies in Taniguchi for the preamble limitations. Rostoker is about antennas on an integrated circuit, not inductors. EX1006, 3:52-65. A POSITA would have known that antennas are not inductors. Antennas are designed to efficiently emit or receive radiation for communication, not to produce magnetic fields that cancel. The primary point of novelty of Rostoker's antennas is to avoid crossing other circuitry on the chip, regardless of their size, geometry, or terminal spacing. EX1006, 6:65-7:2. The '430 Patent's inductors are designed to have a magnetic field that cancels and avoids communicating with other components on the chip. Rostoker does not teach or disclose the first and second inductors formed on a single semiconductor die as claim 11 requires. Rostoker does not overcome the deficiencies in Taniguchi for the preamble limitations.

54. Figs. 6 (below) of Rostoker shows two antennas 604, 624 on a single IC chip 602. EX1006, 8:66-9:2. "[T]he antenna 604 is illustrated as a multi-turn

loop antenna having two ends 604a and 604b that extend from the antenna 604, which is in the second portion 612 of the central area 608 of the chip 602 into the first portion 610 of the central area 608 of the chip 602 so as to be connected to circuitry (not shown) disposed within the first portion 610 of the central area 608 of the chip 602. Similarly, the antenna 624 is illustrated as a multi-turn loop antenna having two ends 624a and 624b that extend from the 30 antenna 624, which is in the third portion 614 of the central area 608 of the chip 602 into the first portion 610 of the central area 608 of the chip 602 so as to be connected to circuitry (not shown) disposed within the first portion 610 of the central area 608 of the chip 602.” EX1006, 9:23-35. The terminals are not close where one end of the spiral terminates in the center, and then the wire has to be brought to the outside to make a connection. There is not the desired symmetry of the terminals.



55. Rostoker teaches using a shield to block antenna signals. EX1006, 4:18-20. That design teaches away from the '430 Patent's Figure 8 which cancels the fields. Rostoker teaches to fill the loop with a core of ferrite, which increases the magnetic flux. EX1006, 6:33-5. One of the stated goals of Rostoker (introduction) is moving the antenna from the periphery to the interior to avoid interfering with pinouts. The connections to the antenna are located in order to avoid interference with pinouts. The locations of the connections are not determined by spacing them closely to cancel the magnetic field. Another goal is to avoid EM interference when the circuitry is located within the antenna loop by relocating the antenna. This teaches away from canceling the field generated by the antenna itself. Also, Rostoker mentions locating both a transmit and receive antenna on the same chip without any concern of the transmit signal feeding back to the receive antenna and causing interference. EX1006, 4:14-21.

56. A POSITA would not have been motivated to apply the teachings of Rostoker to the antenna layout of Taniguchi to arrive at the inductor layouts of the '430 Patent.

N. Ground 3: Midya and Raghavan

57. Intel's proposed combination of Midya and Raghavan does not disclose or teach two connecting two closely spaced terminals connected to the first loop for supplying electrical current to the first and second loops while

minimizing magnetic field contributions from the terminals as required by independent claims 1 and 11 of the '430 Patent. The additional loop generates an EM field that is not reduced or cancelled by any structure in Midya. Raghavan's inductors avoid the asymmetry of conventional spirals by using crossovers and concentric loops such that the current travels only in one direction as it traverses the inductor from the input to the output terminal (a clockwise or counter-clockwise direction but not both). Raghavan's inductor cannot produce counter-propagating magnetic fields that cancel, as required but the '430 patent. The additional interconnection lines that would be required would produce just as much asymmetry, if not more than Midya.

O. Ground 4 – Midya/Raghavan/Gardner

58. Because Gardner's terminals are perpendicular to each other, they cannot cancel each other's EM fields, because the generated EM fields would be orthogonal to one another.

P. Grounds 5-8

59. Dr. Tentzeris provides no testing or methodology to show that the terminals in Taniguchi are close enough so that the magnetic fields are minimized or cancelled.

60. A POSITA would have chosen CMOS IC design rules over Brooks' PCB teachings because Brooks has no applicability to ICs.

In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

I hereby declare that all statements made herein of 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.

Executed January 11, 2025.

Sanibel, Florida

A handwritten signature in cursive script, reading "Paul Prucnal", written over a horizontal line.

Paul R. Prucnal, Ph.D.