United States Patent and Trademark Office

Before the Patent Trial and Appeal Board

Infineon Technologies AG,

(Petitioner)

v.

Feinics AmaTech Teoranta

(Patent Owner)

Inter Partes Review

No. IPR2022-00235 | **U.S. Patent No. 9,195,932**

No. IPR2022-00417 | **U.S. Patent No. 9,033,250**

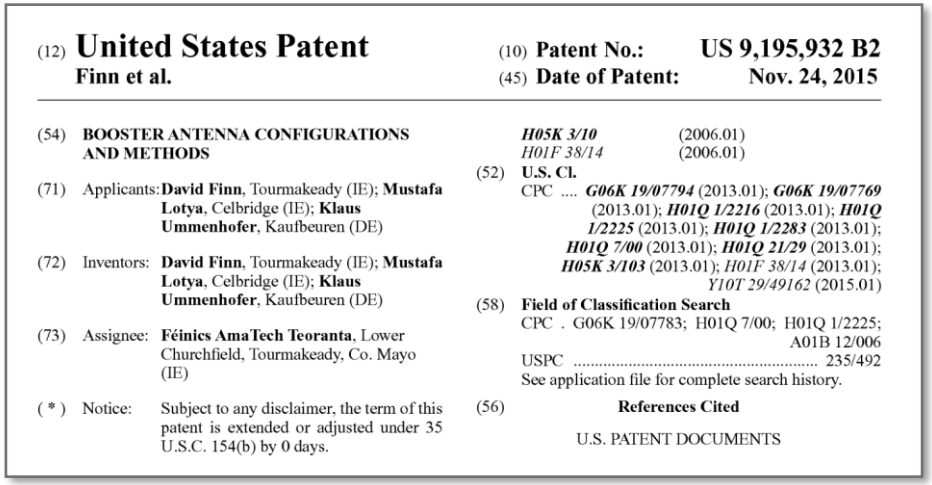
Petitioner's Demonstrative Exhibits

Infineon Exhibit 1056
Infineon v. AmaTech
IPR2022-00235

April 5, 2023

Grounds for Unpatentability

US 9,195,932 B2



(12) **United States Patent**
Finn et al.

(10) **Patent No.: US 9,195,932 B2**
(45) **Date of Patent: Nov. 24, 2015**

(54) **BOOSTER ANTENNA CONFIGURATIONS AND METHODS**

(71) Applicants: **David Finn**, Tourmakeady (IE); **Mustafa Lotya**, Celbridge (IE); **Klaus Ummenhofer**, Kaufbeuren (DE)

(72) Inventors: **David Finn**, Tourmakeady (IE); **Mustafa Lotya**, Celbridge (IE); **Klaus Ummenhofer**, Kaufbeuren (DE)

(73) Assignee: **Féinics AmaTech Teoranta**, Lower Churchfield, Tourmakeady, Co. Mayo (IE)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

H05K 3/10 (2006.01)
H01F 38/14 (2006.01)

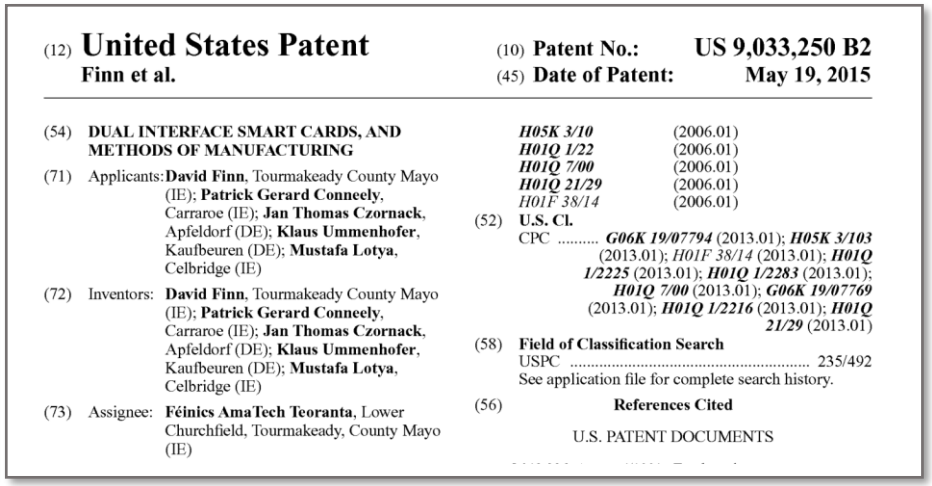
(52) **U.S. Cl.**
CPC ***G06K 19/07794*** (2013.01); ***G06K 19/07769*** (2013.01); ***H01Q 1/2216*** (2013.01); ***H01Q 1/2225*** (2013.01); ***H01Q 1/2283*** (2013.01); ***H01Q 7/00*** (2013.01); ***H01Q 21/29*** (2013.01); ***H05K 3/103*** (2013.01); *H01F 38/14* (2013.01); *Y10T 29/49162* (2015.01)

(58) **Field of Classification Search**
CPC . G06K 19/07783; H01Q 7/00; H01Q 1/2225; A01B 12/006
USPC 235/492
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS

'932 patent (-235 Ex. 1001), page 1

US 9,033,250 B2



(12) **United States Patent**
Finn et al.

(10) **Patent No.: US 9,033,250 B2**
(45) **Date of Patent: May 19, 2015**

(54) **DUAL INTERFACE SMART CARDS, AND METHODS OF MANUFACTURING**

(71) Applicants: **David Finn**, Tourmakeady County Mayo (IE); **Patrick Gerard Conneely**, Carraroe (IE); **Jan Thomas Czornack**, Apfeldorf (DE); **Klaus Ummenhofer**, Kaufbeuren (DE); **Mustafa Lotya**, Celbridge (IE)

(72) Inventors: **David Finn**, Tourmakeady County Mayo (IE); **Patrick Gerard Conneely**, Carraroe (IE); **Jan Thomas Czornack**, Apfeldorf (DE); **Klaus Ummenhofer**, Kaufbeuren (DE); **Mustafa Lotya**, Celbridge (IE)

(73) Assignee: **Féinics AmaTech Teoranta**, Lower Churchfield, Tourmakeady, County Mayo (IE)

H05K 3/10 (2006.01)
H01Q 1/22 (2006.01)
H01Q 7/00 (2006.01)
H01Q 21/29 (2006.01)
H01F 38/14 (2006.01)

(52) **U.S. Cl.**
CPC ***G06K 19/07794*** (2013.01); ***H05K 3/103*** (2013.01); *H01F 38/14* (2013.01); ***H01Q 1/2225*** (2013.01); ***H01Q 1/2283*** (2013.01); ***H01Q 7/00*** (2013.01); ***G06K 19/07769*** (2013.01); ***H01Q 1/2216*** (2013.01); ***H01Q 21/29*** (2013.01)

(58) **Field of Classification Search**
USPC 235/492
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS

'250 patent (-417 Ex. 1001), page 1

III. GROUNDS FOR UNPATENTABILITY

Ground	Reference	Claims	Basis
1	Takeda-322 (Ex. 1005)	1-7	§§ 102/103
2	Takeda-092 (Ex. 1006)	8-10	§ 102
3	Murayama (Ex. 1007)	1-6, 8-10	§ 102
4	Murayama	7	§§ 102/103

-235 Petition, page 1

III. GROUND FOR UNPATENTABILITY

Ground	Reference	Claims	Basis
1	JP 4016322 B2 (Ex. 1005,[1] "Takeda-322")	1-2, 4-8, 10-12, and 18	§ 103

-417 Petition, page 1

* Pursuant to 37 CFR § 1.321(a), patent owner AmaTech Group Limited hereby disclaims claims 8-10 of U.S. Pat. 9,195,932. AmaTech Group Limited is the assignee of

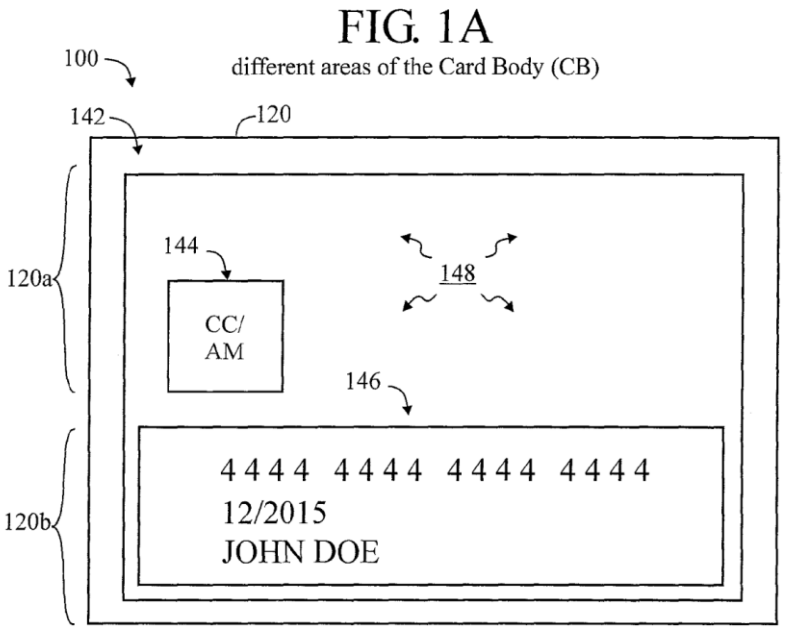
-235 Ex. 2004, page 1

The Patents Relate to Booster Antennas for Contactless Smart Cards

TECHNICAL FIELD

This disclosure relates to smart cards (or other secure documents, and the like), operating at least in a contactless mode (ISO 14443). The smart card may comprise a card body (CB), an antenna module (AM), and a booster antenna (BA). The antenna module (AM) may comprise an RFID (radio frequency identification) chip or chip module (either of which may be referred to as "CM") and a module antenna (MA). The

'932 patent, 1:54-60 (cited at -235 Petition, pages 3-4; -235 POR, page 4)
'250 patent, 1:37-43 (cited at -417 Petition, page 2; -417 POR, page 3)



'932 patent, FIG. 1A (cited at -235 Petition, page 22; -235 POR, pages 4-5)
'250 patent, FIG. 1A (cited at -417 Petition, pages 4-5; -417 POR, pages 3-4)

Booster Antennas Were Known

-235 Petition, page 16;
-235 Reply, page 13

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BACKGROUND

A dual interface (DI or DIF) smart card may generally comprise:
an antenna module AM,
a card body CB, and
a booster antenna BA.

'932 patent, 2:7-22 (cited at -235 Petition, page 16)

PETITION FOR *INTER PARTES* REVIEW

The '932 patent does not expressly define "booster antenna" and admits BAs were known. '932 patent 2:7-22. In a smart card, a BA is a conductive element that enables an IC chip to communicate with an external reader. VDW, ¶¶ 76-77 (citing Ashizaki (Ex. 1011), [0009]-[0010]). The '932 specification acknowledges

-235 Petition, page 16

ASHIZAKI et al.

(10) Pub. No.: US 2008/0184281 A1
(43) Pub. Date: Jul. 31, 2008

[0009] Particularly with a non-contact IC card or RFID (Radio Frequency Identification) employing an electromagnetic induction method represented in the case of a communication frequency of 13.56 MHz, an arrangement has been made wherein a communicating state is in a good condition when the antenna coil of the non-contact IC chip and the antenna coil of a reader/writer side face each other, and accordingly, there are cases wherein communication cannot be performed when the directions of the respective antenna coils are perpendicular to each other (i.e., the normal lines of the antenna coils are perpendicular to each other).

[0010] On the other hand, in a case wherein communication cannot be performed in a good condition due to a problem caused from the positional relation between antennas, a technique has been known wherein a communicating state is improved using an antenna for relay called a booster antenna.

Ashizaki (Ex. 1011), [0009]-[0010]
(cited at -235 Petition, page 16)

PETITIONER'S REPLY TO PATENT OWNER RESPONSE

BAs designed to resonate at multiple frequencies were well-known. VDW-Reply, ¶¶ 56-60 (citing Selker (Ex. 1052); Koyama (Ex. 1053); Hofer (Ex. 1054)); *cf.* Eisenstadt-Dep., 165:16-20, 169:14-18.

-235 Reply, page 13

SUR-REPLY

Petitioner seeks to import numerous permutations of prior art booster antennas for the first time on Reply. Reply, 13 (citing to Exs. 1052 (Selker), 1053 (Koyama), and 1054 (Hofer)). Petitioner lists only the exhibit numbers. Reply, 13. Petitioner's

-235 Sur-Reply, page 21

Booster Antennas Were Known

TECHNICAL FIELD

a contact reader in a contact mode (ISO 7816-2). The booster antenna (BA) may comprise various antenna components, such as a card body antenna (CA) for coupling with an external contactless reader, and a coupling coil (CC) for coupling with the module antenna (MA) of the antenna module (AM).

'932 patent, 1:63-67 (cited at -235 Petition, pages 4, 18, 20);
'250 patent, 1:46-50 (cited at -417 Petition, pages 4, 36, 45)

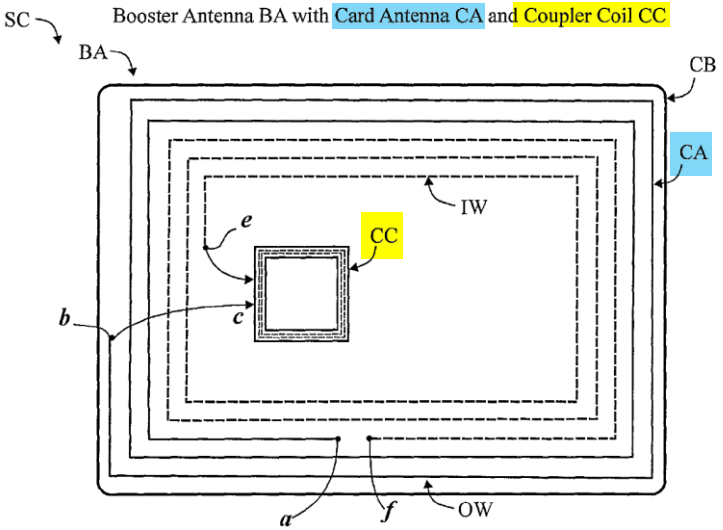
BACKGROUND

The booster antenna BA may generally comprise a relatively large winding which may be referred to as a card antenna CA component (or portion) having a number of turns disposed in a peripheral area of the card body CB, and a relatively small coupler coil (or coupler antenna) CC component (or portion) having a number of turns disposed at a coupling area of the card body CB corresponding to the antenna module AM.

'932 patent, 2:41-48 (cited at -235 Petition, pages 4, 16, 18, 49);
'250 patent, 2:24-31 (cited at -417 Petition, pages 4, 36, 45)

FIG. 2

Booster Antenna BA with Card Antenna CA and Coupler Coil CC



'932 patent FIG. 2 (cited at -235 Petition, pages 37-38); '250 patent FIG. 2

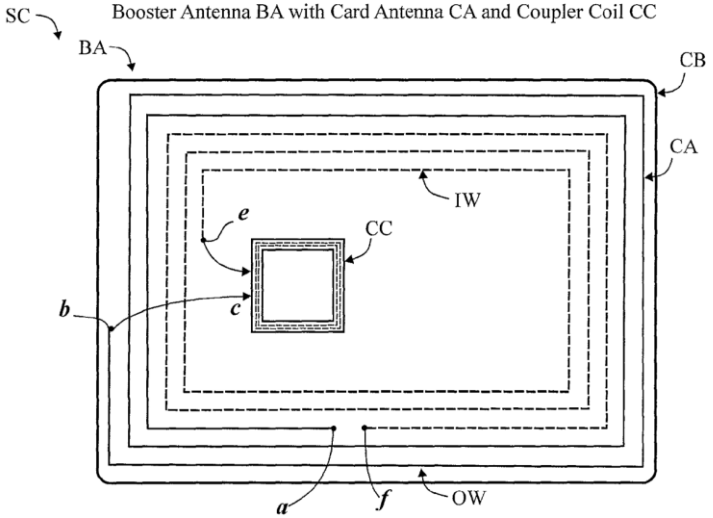
FIG. **2** shows a booster antenna BA comprising a card antenna CA component extending around the peripheral area (**142**) of a card body CB, and having two windings—an outer winding OW and an inner winding IW, both extending substantially around the peripheral area (**142**) of the card body CB. Additionally, a coupler coil CC is shown which may be disposed in the coupling area (**144**).

'932 patent, 11:30-35 (cited at -235 Petition, page 37); '250 patent, 9:66-10:4

Examples of Booster Antennas

FIG. 2

Booster Antenna BA with Card Antenna CA and Coupler Coil CC



'932 patent FIG. 2 (cited at -235 Petition, pages 37-38); '250 patent FIG. 2

3. Claims 1-5, and 9 are rejected under pre-AIA 35 U.S.C. 102b as being anticipated by Kuramochi US 2002/01628974 A1.

'932 FH (-235 Ex. 1002), 450 (cited at -235 Petition, pages 7-8)

Kuramochi

(10) **Pub. No.: US 2002/0162894 A1**
(43) **Pub. Date: Nov. 7, 2002**

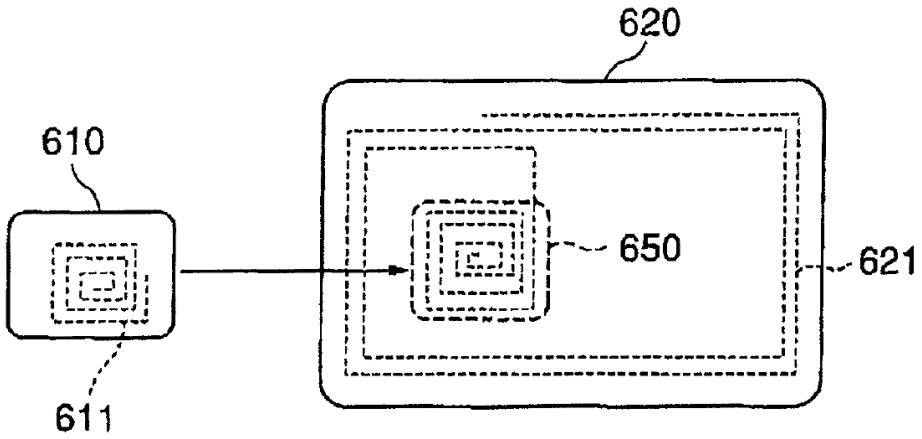


FIG.6A

Kuramochi (-235 Ex. 1010) (cited at -235 Petition, pages 7-8), FIG. 6A;
-235 van der Weide Decl. (-235 Ex. 1003), ¶ 47 (cited at -235 Petition, page 7)

Representative Claims

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1. A booster antenna (BA) comprising a card antenna (CA) component extending around a periphery of a card body (CB), a coupler coil (CC) component disposed at a coupling area of the card body (CB) corresponding to an antenna module (AM), and an extension antenna (EA) component, characterized by:

the extension antenna (EA) component has a sense opposite to that from the card antenna (CA) component.

'932 patent, claim 1

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1. Card Body (CB) for a smart card, comprising:

a surface having a surface area, an upper portion of the surface constituting approximately half of the surface area of the card body and a lower portion of the surface constituting a remaining approximately half of the surface area of the card body;

a first area extending around a peripheral portion of the card body in at least the upper portion of the card body;

a card antenna (CA) disposed in the first area;

a second area located in the upper portion of the card body and corresponding in size to and at a position corresponding to a location of an antenna module (AM) for the smart card;

a third area located in the upper portion of the card body which is separate from the first area and the second area;

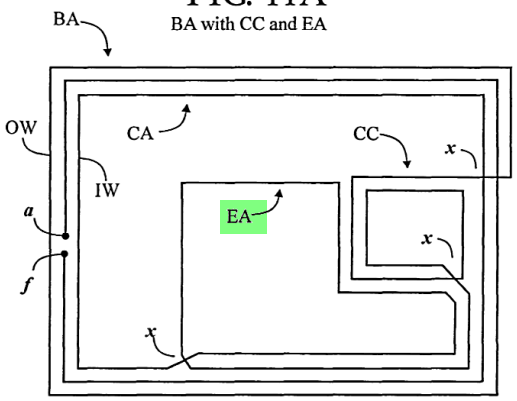
a coupler coil (CC) disposed in the second area; and

an extension antenna (EA) disposed in the third area.

'250 patent, claim 1

An Extension Antenna Contributes to the BA's Inductance

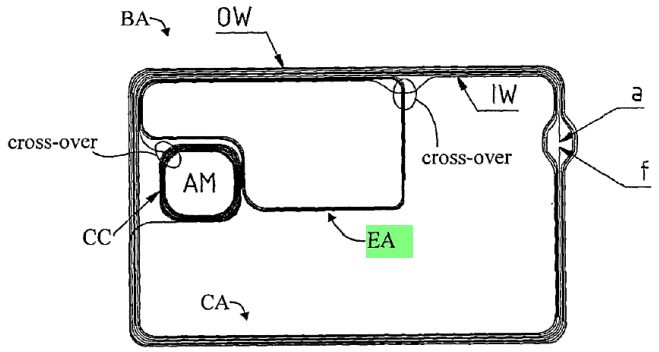
FIG. 11A
BA with CC and EA



The CC component is a small coil that inductively couples the RFID chip to the BA. *Id.*, 1:57-67, 2:44-48, 4:53-59, 16:48-53. The CA component is a larger coil, extending around at least some portion of the card's periphery, that couples to an external contactless reader. *Id.,* 1:63-66, 2:41-44. The EA component is an additional coil, disposed in available card space, that contributes to the BA's inductance. *Id.*, 10:58-67, 27:35-44.

-235 Petition, page 4

FIG. 4B



The CC is a small coil that inductively couples the RFID chip to the BA. *Id.*, 1:46-50, 2:24-31, 4:37-43, 14:40-45. The CA is a larger coil, extending around at least some portion of the card's periphery, that couples to an external contactless reader. *Id.,* 1:48-49, 2:24-27. The EA is an additional coil, disposed in available CB space, that contributes to the BA's inductance. *Id.*, 9:27-36, 23:61-24:3.

-417 Petition, page 4

An Extension Antenna Contributes to the BA's Inductance

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(57) **ABSTRACT**

A booster antenna (BA) for a smart card comprises a card antenna (CA) component extending around a periphery of a card body (CB), a coupler coil (CC) component at a location for an antenna module (AM), and an extension antenna (EA) contributing to the inductance of the booster antenna (BA). A method of wire embedding is also disclosed, by controlling a force and ultrasonic power applied by an embedding tool at different positions on the card body (CB).

'932 patent, Abstract (cited at -235 Reply, page 3)

SUMMARY

The extension antenna (EA) contributes to the inductance of the booster antenna (BA), and may be in the form of a coil comprising at least one cross-over. The extension antenna (EA) may be connected at one end to the booster antenna (BA). The extension antenna (EA) has two ends. One end may be connected to an end of the coupler coil (CC). One end may be connected to the card antenna (CA), or left unconnected as a free end.

'932 patent, 5:52-53 (cited at -235 Petition, page 74; -235 POR, page 17; -235 Reply, pages 3, 9)

US 9,033,250 B2

(57) **ABSTRACT**

A booster antenna (BA) for a smart card comprises a card antenna (CA) component extending around a periphery of a card body (CB), a coupler coil (CC) component at a location for an antenna module (AM), and an extension antenna (EA) contributing to the inductance of the booster antenna (BA). A method of wire embedding is also disclosed, by controlling a force and ultrasonic power applied by an embedding tool at different positions on the card body (CB).

'250 patent, Abstract (cited at -417 Petition, page 58; -417 Reply, page 11)

SUMMARY

The extension antenna (EA) contributes to the inductance of the booster antenna (BA), and may be in the form of a coil comprising at least one cross-over. The extension antenna (EA) may be connected at one end to the booster antenna (BA). The extension antenna (EA) has two ends. One end may be connected to an end of the coupler coil (CC). One end may be connected to the card antenna (CA), or left unconnected as a free end.

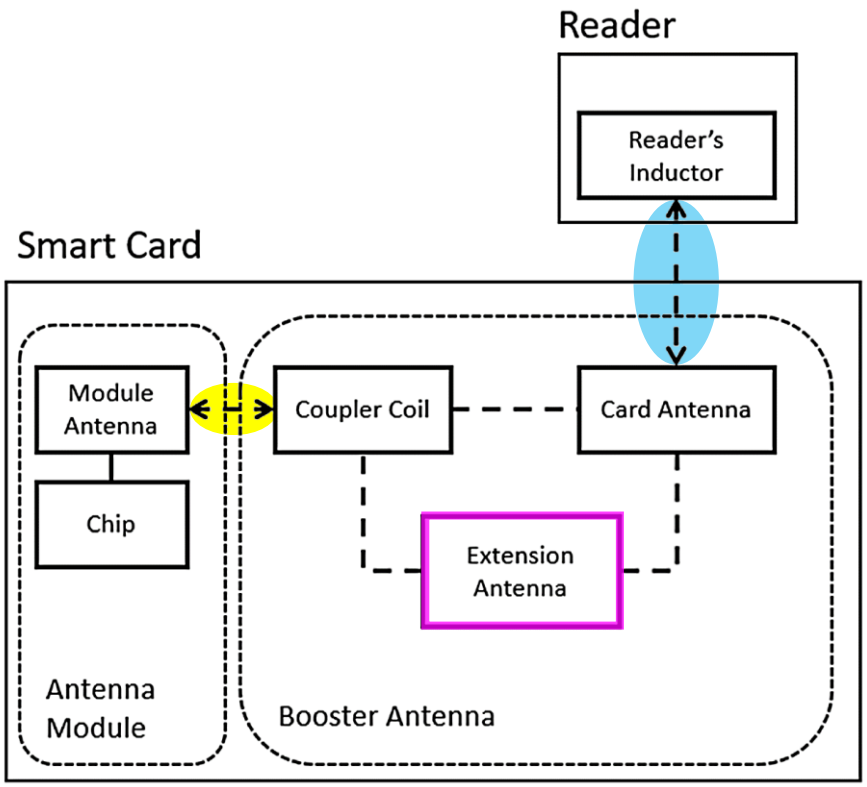
'250 patent, 5:36-37 (cited at -417 Petition, page 58; -417 Reply, page 11)

An EA May Enhance Overall Coupling Between the BA and a chip, and/or the BA and an external reader

-235 Reply, page 8;
-417 Reply, pages 9-10

A "coupling area" (**144**) may be defined as the area immediately under the antenna module AM (and its module antenna (MA)). The coupler coil CC may be typically located in the coupling area. The extension antennas EA may be disposed in other than the coupling area, as discussed above, but nevertheless may enhance the overall coupling between the booster antenna BA and the module antenna MA, and/or the booster antenna BA and the antenna of an external reader.

'932 patent, 18:58-62 (cited at -235 POR, page 22; -235 Reply, page 8)
'250 patent, 16:37-41 (cited at -417 POR, page 10; -417 Reply, pages 9-10)



Patent Owner's Figure (from -235 POR, page 6; -417 POR, page 5) with additional highlights

Prosecution History of the ’250 Patent

Listing of Claims:

1. (currently amended) Card Body (CB) for a smart card, comprising:

a surface having a surface area, an upper portion of the surface constituting approximately half of the surface area of the card body and a lower portion of the surface constituting a remaining approximately half of the surface area of the card body;

a first area ~~for~~ extending around a peripheral portion of the card body in at least the upper portion of the card body;

a card antenna (CA) disposed in the first area;

a second area located in the upper portion of the card body and corresponding in size to an antenna module (AM) for the smart card;

a third area located in the upper portion of the card body which is separate from the first area and the second area; and

an extension antenna (EA) disposed in the third area.

’250 FH (-417 Ex. 1002), page 175 (cited at -417 Petition, page 6)

3. Claims 1-5, 7-14 and 21 rejected under pre-AIA 35 U.S.C. 102b as being anticipated by Emori et al. US 6,378,774 B1.

’250 FH (-417 Ex. 1002), page 187 (cited at -417 Petition, page 6)

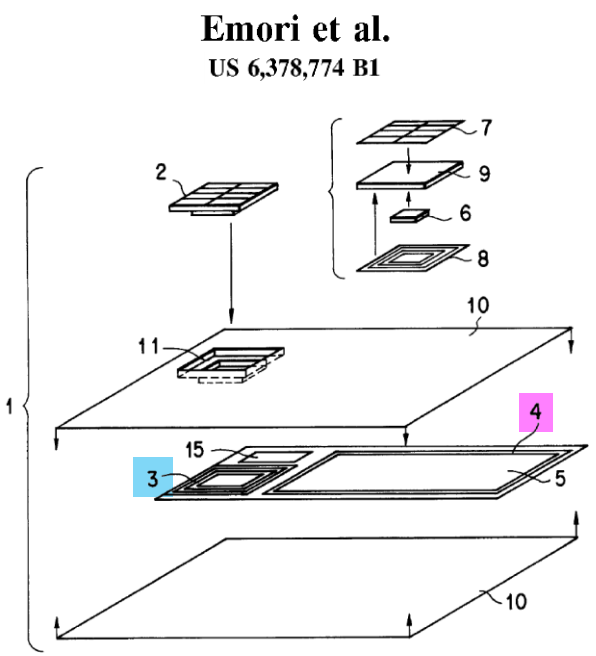


FIG. 8A

Emori (-417 Ex. 1010), FIG. 8A (cited at -417 Petition, page 6)

Prosecution History of the ’250 Patent

Amendments to the Claims

Listing of Claims:

1. (currently amended) Card Body (CB) for a smart card, comprising:

a surface having a surface area, an upper portion of the surface constituting approximately half of the surface area of the card body and a lower portion of the surface constituting a remaining approximately half of the surface area of the card body;

a first area extending around a peripheral portion of the card body in at least the upper portion of the card body;

a card antenna (CA) disposed in the first area;

a second area located in the upper portion of the card body and corresponding in size to and at a position corresponding to a location of an antenna module (AM) for the smart card;

a third area located in the upper portion of the card body which is separate from the first area and the second area;

a coupler coil (CC) disposed in the second area; and

an extension antenna (EA) disposed in the third area.

’250 FH (-417 Ex. 1002), page 202 (cited at -417 Petition, page 7)

Applicant's Remarks

In all of these embodiments, Emori has only two distinct antenna components on the card substrate 10 – the antenna coil 4 and the (second) coupler coil 3.

In FIGs. 8A/8B, Emori shows a coupler coil 3 corresponding generally to the coupler coil CC component of the present invention (claim 2), with an antenna coil 4 in allocation on an antenna substrate 5 that corresponds generally with Applicant's residual area 148 (FIG. 1A).

In the present invention, there are **three distinct antenna components** on the card body. For example, FIG. 3B shows

a card antenna CA component in the peripheral area of the card body CB

a coupler coil CC component in the coupling area of the card body CB

an extension antenna EA component in the residual area of the card body CB

’250 FH (-417 Ex. 1002), page 207 (cited at -417 Petition, page 7)

Prosecution History of the ’932 Patent

What is claimed is:

1. A booster antenna (BA) comprising at least a card antenna (CA) component extending around a periphery of a card body (CB) and an extension antenna (EA) component, characterized by:

the extension antenna (EA) component has a sense opposite to that from the card antenna (CA) component.

’932 FH (-235 Ex. 1002), page 123 (cited at -235 Petition, page 7)

3. Claims 1-5, and 9 are rejected under pre-AIA 35 U.S.C. 102b as being anticipated by Kuramochi US 2002/01628974 A1.

Kuramochi teaches:

With respect to claim 1, A booster antenna comprising at least a card antenna component extending around a periphery of a card body and an extension antenna component, characterized by: the extension antenna component has a sense opposite to that from the card antenna component (Figure 6a teaches booster antenna, 621 and extension antenna, 650 and corresponding passages)

’932 FH (-235 Ex. 1002), page 450 (cited at -235 Petition, page 7)

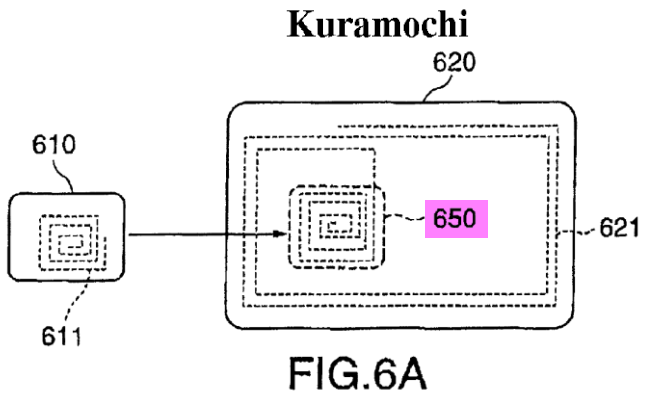


FIG.6A

Kuramochi (-235 Ex. 1010) (cited at -235 Petition, pages 7-8), FIG. 6A; -235 van der Weide Decl. (-235 Ex. 1003), ¶ 47 (cited at -235 Petition, page 7)

Prosecution History of the ’932 Patent

Amendments to the Claims

Listing of Claims:

1. (currently amended) A booster antenna (BA) comprising ~~at least~~ a card antenna (CA) component extending around a periphery of a card body (CB), a coupler coil (CC) component disposed at a coupling area of the card body (CB) corresponding to an antenna module (AM), and an extension antenna (EA) component, characterized by:

the extension antenna (EA) component has a sense opposite to that from the card antenna (CA) component.

’932 FH (-235 Ex. 1002), page 467 (cited at -235 Petition, page 7)

REMARKS

Kuramochi’s element 620 is a booster card that has a densely coiled part 650 (comparable to Applicant’s coupler coil CC) and a booster antenna coil 621 (comparable to Applicant’s card antenna CA).

Claim 1 is amended to include the coupler coil (CC) component of **claim 2** (canceled). The overall booster antenna (BA) now has 3 components (CA, CC, EA). See also **claim 6**.

’932 FH (-235 Ex. 1002), page 470 (cited at -235 Petition, page 8)

Kuramochi’s overall antenna has only two components (621, 650). From FIG. 6A, it is evident that the “sense” of the two components is the same as one another.

’932 FH (-235 Ex. 1002), page 471 (cited at -235 Petition, page 8)

Applicant Emphasized Three Components, Not Two

-235 Petition, pages 7-8
-417 Petition, pages 6-7

Applicant's Remarks

US 9,033,250 B2

In the present invention, there are **three distinct antenna components** on the card body. For example, FIG. 3B shows

a card antenna CA component in the peripheral area of the card body CB

a coupler coil CC component in the coupling area of the card body CB

an extension antenna EA component in the residual area of the card body CB

'250 FH (-417 Ex. 1002), page 207 (cited at -417 Petition, page 7)

In all of these embodiments, Emori has only two distinct antenna components on the card substrate 10 – the antenna coil 4 and the (second) coupler coil 3.

'250 FH (-417 Ex. 1002), page 207 (cited at -417 Petition, page 7)

US 9,195,932 B2

Claim 1 is amended to include the coupler coil (CC) component of **claim 2** (canceled). The overall booster antenna (BA) now has 3 components (CA, CC, EA). See also **claim 6**.

'932 FH (-235 Ex. 1002), page 470 (cited at -235 Petition, page 8)

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'932 FH (-235 Ex. 1002), page 471 (cited at -235 Petition, page 8)

Emori et al.

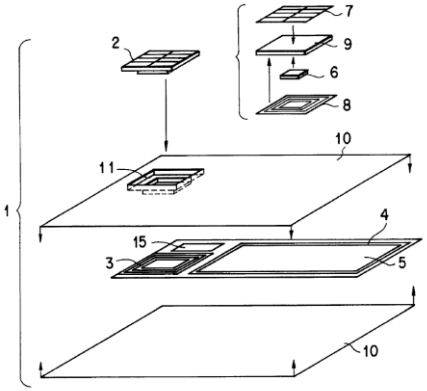


FIG. 8A

Emori (-417 Ex. 1010), FIG. 8A (cited at -417 Petition, page 6)

Kuramochi

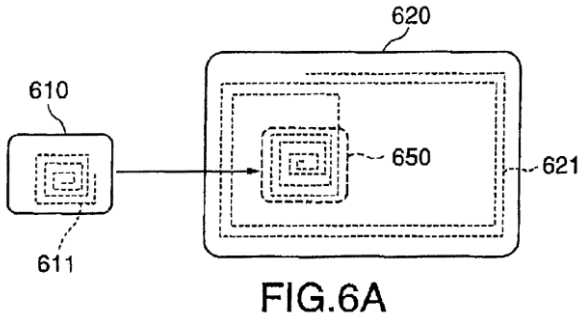


FIG.6A

Kuramochi (-235 Ex. 1010) (cited at -235 Petition, pages 7-8), FIG. 6A; -235 van der Weide Decl. (-235 Ex. 1003), ¶ 47 (cited at -235 Petition, page 7)

Consequence of the Prosecution Histories

PHILLIPS v. AWH CORP.
Cite as 415 F.3d 1303 (Fed. Cir. 2005)

Autogiro, 384 F.2d at 399. Like the specification, the prosecution history provides evidence of how the PTO and the inventor understood the patent. *See Lemelson v. Gen. Mills, Inc.*, 968 F.2d 1202, 1206 (Fed.Cir.1992). Furthermore, like the

Phillips v. AWH Corp., 415 F.3d 1303 (Fed. Cir. 2005) (cited at -235 Institution Decision (Paper 13), page 8; -417 Institution Decision (Paper 16), page 8), at 1317

Original claims in '250 and '932:
CB or BA, comprising CA and EA

'250 FH (-417 Ex. 1002), page 175 (cited at -417 Petition, page 6);
'932 FH (-235 Ex. 1002), page 123 (cited at -235 Petition, page 7)

Amended claims in '250 and '932:
CB or BA, comprising CA, EA, **and CC**

'250 FH (-417 Ex. 1002), page 202 (cited at -417 Petition, page 7);
'932 FH (-235 Ex. 1002), page 467 (cited at -235 Petition, page 7)

LEMELSON v. GENERAL MILLS, INC.
Cite as 968 F.2d 1202 (Fed. Cir. 1992)

Despite its internal disagreement regarding the claim as supplemented, the PTO was consistent on one point—at no time did the PTO conclude that the five clauses in the original claim, which are the first five of the seven clauses of claim 3, patentably distinguish Lemelson's invention from the prior art.

Lemelson, on the other hand, takes the position in his brief on appeal to this court that the supplemental clauses—clauses [f] and [g]—do nothing to distinguish Gardiol and the other prior art. He argues that the distinctions between claim 3 and the prior art occur in the limitations described in the first five clauses of claim 3. Lemelson justifies this position by suggesting that the Examiner's rejection of the five-clause claim as anticipated by Gardiol simply "did not make sense. Patent examiners, like the rest of us, occasionally make mistakes."

This argument is without merit. During prosecution of the original patent, Lemelson cancelled the five-clause claim in face of the Examiner's rejection, and submitted for allowance the claim with the additional clauses, as suggested by the Examiner. Lemelson cannot acquiesce to a rejection and to an agreed alternative, and now years later shift his stance 180° to argue for a second bite at the abandoned apple. Other players in the marketplace are entitled to rely on the record made in the Patent Office in determining the meaning and scope of the patent.

The question of whether the original five-clause claim was patentable over Gardiol and the other prior art is thus foreclosed.[5] If reissue claim 3 is distinguishable at all from the prior art, it must be because of something in the added two clauses. The evidence adduced at trial would not allow a reasonable jury to read the prosecution history and the specification any other way.

Lemelson v. General Mills, Inc., 968 F.2d 1202, 1207-08 (Fed. Cir. 1992) (cited at -235 Petition, page 26)

Takeda-322 Grounds

Patent Owner Only Disputes That Takeda-322 has an EA

US 9,195,932 B2

1. A booster antenna (BA) comprising a card antenna (CA) component extending around a periphery of a card body (CB), a coupler coil (CC) component disposed at a coupling area of the card body (CB) corresponding to an antenna module (AM), and an extension antenna (EA) component, characterized by:

the extension antenna (EA) component has a sense opposite to that from the card antenna (CA) component.

'932 patent, claim 1

5. Booster antenna (BA) comprising the following components:

a card antenna (CA) component;

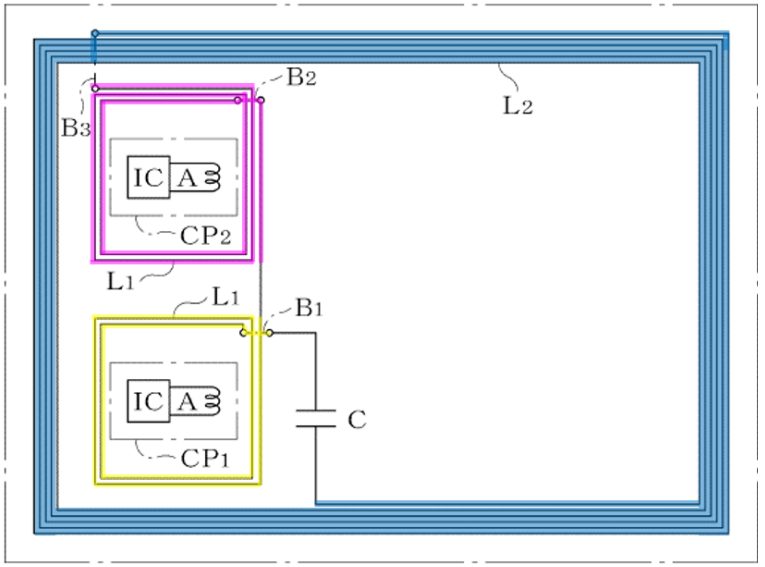
a coupler coil (CC) component; and

an extension antenna (EA) component;

characterized in that:

at least one of the components has a sense which is opposite one or more of the other components.

'932 patent, claim 5



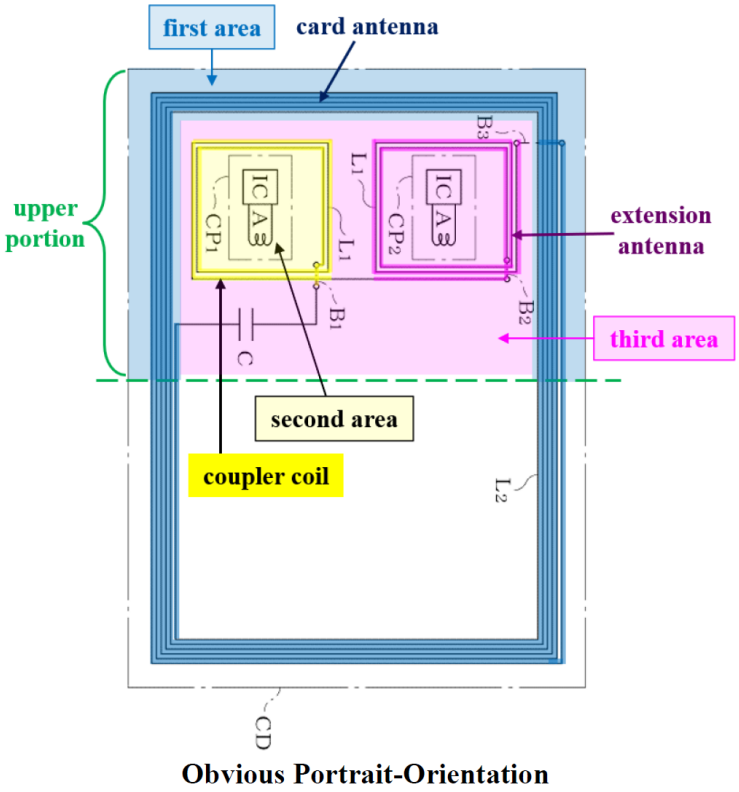
Takeda-322 (Ex. 1005), FIG. 3 (annotated) (from -235 Petition, page 17)

Patent Owner Only Disputes That Takeda-322 has an EA

US 9,033,250 B2

1. Card Body (CB) for a smart card, comprising:
a surface having a surface area, an upper portion of the surface constituting approximately half of the surface area of the card body and a lower portion of the surface constituting a remaining approximately half of the surface area of the card body;
a first area extending around a peripheral portion of the card body in at least the upper portion of the card body;
a card antenna (CA) disposed in the first area;
a second area located in the upper portion of the card body and corresponding in size to and at a position corresponding to a location of an antenna module (AM) for the smart card;
a third area located in the upper portion of the card body which is separate from the first area and the second area;
a coupler coil (CC) disposed in the second area; and
an extension antenna (EA) disposed in the third area.

'250 patent, claim 1



Obvious Portrait-Orientation

Takeda-322 (Ex. 1005), FIG. 3 (annotated) (from -417 Petition, page 48)

Takeda-322's Third Coil Contributes to the BA's Inductance

101. Additionally, based on the three coils in Takeda-322's multi-coil antenna, which are connected in "series" (Takeda-322, [0029]-[0030]), I understand (and a POSA would have understood) that *each* coil in Takeda-322's FIG. 3 embodiment—including the upper inner coil identified above as an extension antenna component—additively contributes to the inductance of Takeda-322's booster antenna. *See* Takeda-322, [0015] (teaching that the number of turns of each coil in Takeda-322 can be chosen to "realize a necessary inductance" in Takeda-322's multi-coil antenna). For documentary evidence corroborating the background knowledge of a POSA that adding inductors to a circuit in series contributes to the circuit's inductance, *see* Hayt (Exhibit 1013)[4], at 152-153.

-235 van der Weide Decl. (-235 Ex. 1003), ¶ 101 (cited at -235 Petition, page 25);
see also -417 van der Weide Decl. (-417 Ex. 1003), ¶ 139 (describing same in context of Takeda implementations described in -417 Petition) (cited at -417 Petition, page 50).

The inductance which is equivalent to several inductances connected in series is simply the sum of the series inductances. This

Hayt (Ex. 1013), page 153 (cited at -235 Petition, page 25; -417 Petition, pages 50, 58, 81)

With respect to characteristic #5, any electrical component (or portion thereof) in a booster antenna contributes to the inductance of the booster antenna, including any length of the conductor itself or a subset of turns for a given antenna component.

-417 POR, page 21

65. With respect to characteristic #5, literally any electrical component (or portion thereof) in a booster antenna contributes to the inductance of the booster antenna, including any length of the conductor itself or a subset of turns for a given antenna component. Further, Petitioner's proposal fails to account for the fact that

-417 Eisenstadt Decl. (-417 Ex. 2003 and -235 Ex. 1051), ¶ 65
(cited at -235 Reply, page 11; -417 POR, page 21; -417 Reply, page 14)

The Institution Decisions Credited the Petitions' Evidence

Petitioner asserts that the second inner coil is an extension antenna disposed in a third area as claim 1 recites. Pet. 41–43; 48–55. Based on the current record, we find Petitioner's assertion to be persuasive and supported by evidence. The second inner coil that Petitioner identifies is equivalent, at least in relevant respects, in structure and function to the extension antenna of the '250 patent. *Compare* Ex. 1001, 9:27–36 (explaining that the antenna extension EA may be "connected with one or both of the card antenna CA and coupler coil CC"), 15:52–57 (explaining that extension antenna EA may be a continuation of card antenna CA and may have several turns of wire), 16:6–9 (providing similar explanation), 23:61–24:3 (explaining that extension antenna involves a crossover that contributes to inductance) *with* Ex. 1005 ¶¶ 14 (explaining that antenna turns add to signal-amplifying action), 15 (explaining that booster coil spirals may achieve necessary inductance), 29 (explaining that exciting coils may be connected in series with the booster coils), 30 (providing similar teaching), Fig. 3; *see also* Ex. 1003 ¶¶ 135–138 (Petitioner's witness, Dr. Weide, explaining how characteristics of Takeda-322's coil and the '250 patent's coil are "comparable").

-417 Institution Decision (Paper 16), page 14

are sufficient to meet the threshold of § 314(a). Petitioner persuasively directs us to where it believes each element of the challenged claims is disclosed by Takeda-322. On the current record, Petitioner's allegations are well supported by the testimony of Dr. van der Weide. In addition, on this record, we are persuaded by Petitioner's argument that the '932 patent claims are not limited to embodiments in which the extension antenna EA only may perform a single function. Petitioner persuasively directs us to a passage from the '932 patent in which the EA and the CC are "essentially combined with one another." Pet. 35 (quoting Ex. 1001, 19:49–63). Therefore, we are persuaded that Petitioner has shown sufficiently that claims 1 and 5 are anticipated by and would have been obvious over the teachings of Takeda-322.

-235 Institution Decision (Paper 13), page 20

Patent Owner's Arguments About Takeda-322

- **An Extension Antenna Cannot Also Be a Coupler Coil**

  -235 POR, pages 39-45; -417 POR, pages 22-27

- **An Extension Antenna Must Enhance Coupling Between the Module Antenna of a Chip and the Booster Antenna**

  -235 POR, pages 22-23; -417 POR, pages 10-11

- **Petitioner Has Not Shown That Takeda-322's Inner Coil Non-Negligibly Contributes to the Booster Antenna's Inductance** -235 POR, pages 57-58; -417 POR, pages 38-39

- **Petitioner's Construction of "EA component" is Essentially Meaningless** -235 Sur-Reply, pages 7-10; -417 Sur-Reply, pages 7-10

Nothing Precludes a Coil From Serving as an EA and a CC

PATENT OWNER RESPONSE

iii. The Extension Antenna Is Not a Coupler Coil

Petitioner attempts to conflate the extension antenna with a coupler coil. Petitioner ignores black-letter patent law that different claim terms are presumed to have different meanings. *See Amgen Inc. v. Sandoz Inc.*, 923 F.3d 1023, 1031 (Fed. Cir. 2019) ("[O]ur precedent instructs that different claim terms are presumed to have different meanings.") (quoting *Helmsderfer v. Bobrick Washroom Equip., Inc.*, 527 F.3d 1379, 1382 (Fed. Cir. 2008)), *reh'g granted, opinion modified*, 776 F. App'x 707 (Fed. Cir. 2019). Petitioner fails to identify any evidence that would overcome the presumption of different meanings. *Cf. Baran v. Medical Device Technologies, Inc.*, 616 F.3d 1309, 1316 (Fed. Cir. 2010) ("[T]he use of different terms implies that they have different meanings … but that implication is overcome where, as here, the evidence indicates that the patentee used the two terms interchangeably."). Nor could Petitioner identify such evidence, as the '932 patent and the ancestral applications consistently describe the extension antenna and coupler coil has having distinct structures and operations. *See* §§ V.D, V.E.2, *supra*. Ex. 2003, ¶ 87.

-235 POR, pages 39-40; *see also* -417 POR, pages 22-23 (arguing same in the context of the '250 patent)

Nothing Precludes a Coil From Serving as an EA and a CC

PETITION FOR *INTER PARTES* REVIEW

(1) *Nothing Precludes an EA Component from Performing Another Function*

It is immaterial that Takeda-322's upper inner coil ***also serves*** the additional function of coupling IC chip CP_2 to booster coil L_2. VDW, ¶ 103. Nothing in the claims, the '932 specification, or prosecution history imposes a negative limitation that restricts the function of the extension antenna component to prevent it from also coupling an on-card chip to the BA.

The specification says the ***same coil*** may serve as both an extension antenna component ***and*** a coupler coil component. VDW, ¶ 104; '932 patent, 19:49-63 (in FIG. 4F "the coupler coil CC and extension antenna EA are essentially combined with one another, as a [single] coil").

-235 Petition, page 25; *see also* -417 Petition, pages 50-51, 82 (arguing same in the context of the '250 patent)

FH, 123. The Examiner rejected those claims over a two-coil antenna with CC and CA components (*id.*, 470), and thus read the claimed EA component on a coupler coil. The applicant did ***not***—indeed could not given the '932 patent's FIG. 4F embodiment—argue that the prior art coupler coil did not meet the claimed EA (*id.*, 469-71), and acceded to the examiner's interpretation that "extension antenna component" encompasses a coil that also serves as a coupler coil. *Lemelson v. General Mills*, 968 F.2d 1202, 1207-08 (Fed. Cir. 1992). The claims were allowed

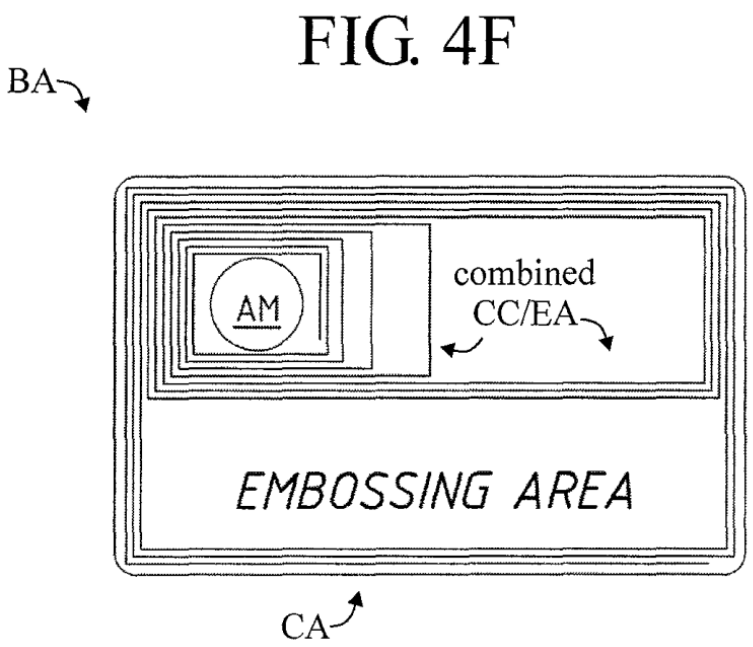
-235 Petition, page 26

DECISION
Granting Institution of *Inter Partes* Review

are sufficient to meet the threshold of § 314(a). Petitioner persuasively directs us to where it believes each element of the challenged claims is disclosed by Takeda-322. On the current record, Petitioner's allegations are well supported by the testimony of Dr. van der Weide. In addition, on this record, we are persuaded by Petitioner's argument that the '932 patent claims are not limited to embodiments in which the extension antenna EA only may perform a single function. Petitioner persuasively directs us to a passage from the '932 patent in which the EA and the CC are "essentially combined with one another." Pet. 35 (quoting Ex. 1001, 19:49–63). Therefore, we are persuaded that Petitioner has shown sufficiently that claims 1 and 5 are anticipated by and would have been obvious over the teachings of Takeda-322.

-235 Institution Decision (Paper 13), page 20

FIG. 4F Shows One Coil Serving as an EA and a CC



'932 patent, FIG. 4F (cited at -235 Petition, pages 25-26; -235 POR, pages 40-44; -235 Reply, pages 5-7)
'250 patent, FIG. 4F (cited at -417 Petition, pages 51, 82; -417 POR, pages 23-27; -417 Reply, pages 6-9)

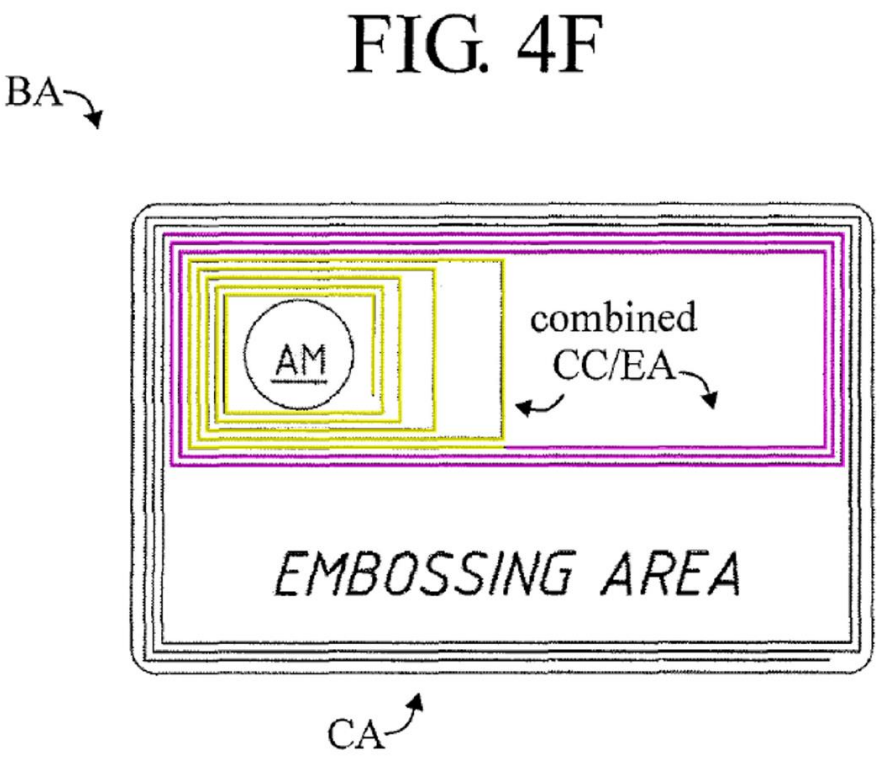
discernable. Instead, FIG. 4F shows that the coupler coil and extension antenna have been separately arranged such that they are formed by one asymmetric coil. The

-235 POR, page 43; -417 POR, page 26

longer be discerned from each other. FIG. 4F shows that the coupler coil and extension antenna have been separately arranged such that they are formed by one asymmetric coil. This asymmetry can vary by changing the layout of the extension

-235 Eisenstadt Decl. (-235 Ex. 2003), ¶ 89;
-417 Eisenstadt Decl. (-417 Ex. 2003 and -235 Ex. 1051), ¶ 69

Patent Owner's Annotated Version of FIG. 4F



Patent Owner's annotated FIG. 4F (from -235 POR, page 41; -417 POR, page 24)

The Patents Call the Coil in FIG. 4F "the combined CC/EA antenna component"

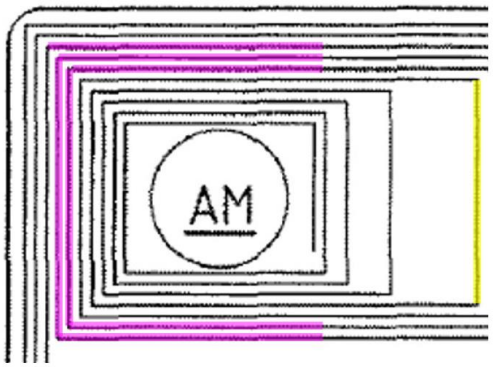
FIG. **4F** shows that the booster antenna BA may extend around the peripheral area (**142**) of the card body CB, and also into the coupling area (**144**) and the residual area (**148**), while avoiding the embossing area (**146**). In this example, the coupler coil CC and extension antenna EA are essentially combined with one another, as a coil wherein the turns increase in pitch as the combined CC/EA booster antenna component extends across the residual area.

There is no true center to the coil formed by the combined coupler coil CC and extension antenna EA components, and the antenna module AM is positioned asymmetrically with respect to the combined CC/EA antenna component, and the degree of asymmetry can be varied by varying the pitch of the turns within the extension antenna (EA) in the area above the embossing area.

'932 patent, 19:49-63 (cited at -235 Petition, page 25; -235 POR, page 40);
'250 patent, 17:28-42 (cited at -417 Petition, pages 51, 82; -417 POR, page 23)

Patent Owner's Annotated Border in FIG. 4F is Arbitrary

27. Further, as shown below, several parts of Patent Owner's purported "discernable" extension antenna are in fact much closer to the antenna module than parts of the coupler coil. A POSA would have expected those closer (pink) turns of the purported extension antenna part to more strongly couple to the antenna module than those of the purported (yellow) coupler coil part at far right, contradicting Patent Owner's suggestion that an extension antenna is prohibited from coupling the booster antenna to an antenna module.



-417 van der Weide Reply Decl. (-417 Ex. 1055), ¶ 27 (cited at -417 Reply, page 8);
see also -235 van der Weide Reply Decl. (-235 Ex. 1055), ¶ 24 (cited at -235 Reply, page 6).

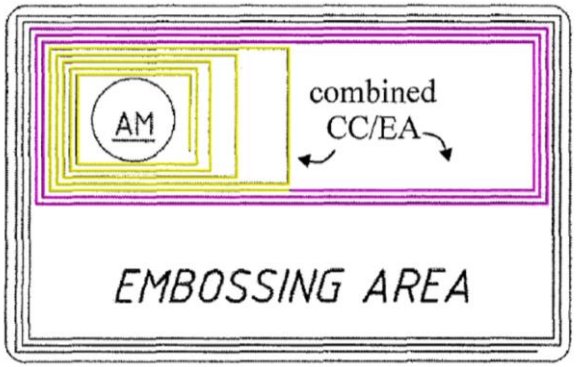
Patent Owner's Annotated Border in FIG. 4F is Arbitrary

been separately arranged such that they are formed by one asymmetric coil. The asymmetry can be varied by changing the layout of the extension antenna alone (*i.e.*, not the coupler coil). '932 patent, 20:18 ("[T]he antenna module AM is positioned asymmetrically with respect to the combined CC/EA antenna component, and the degree of asymmetry can be varied by varying the pitch of the turns within the extension antenna (EA) in the area above the embossing area."). Ex. 2003, ¶ 89.

-235 POR, page 43; *see also* -417 POR, page 26
(arguing same in the context of the '250 patent)

asymmetric coil. This asymmetry can vary by changing the layout of the extension antenna alone. '932 patent, 20:18 ("[T]he antenna module AM is positioned asymmetrically with respect to the combined CC/EA antenna component, and the degree of asymmetry can be varied by varying the pitch of the turns within the extension antenna (EA) in the area above the embossing area.").

-235 Eisenstadt Decl. (-235 Ex. 2003), ¶ 89; *see also* -417 Eisenstadt Decl. (-417 Ex. 2003 and -235 Ex. 1051), ¶ 69 (arguing same in the context of the '250 patent)



Patent Owner's annotated FIG. 4F (from -235 POR, page 41; -417 POR, page 24)

Q. Right. And so my question now, directing you back to Figure 4F, which portion of the combined CC/EA component shows turns with varying pitch?
A. The C sub C portion shows --
Q. The yellow portion?
A. The yellow portion, yeah.
Q. The CC portion.
A. The CC portion, which is -- it is what it is.

Eisenstadt Dep. (Ex. 1050), 150:8-24 (cited at -235 Reply, page 6; -417 Reply, page 8)

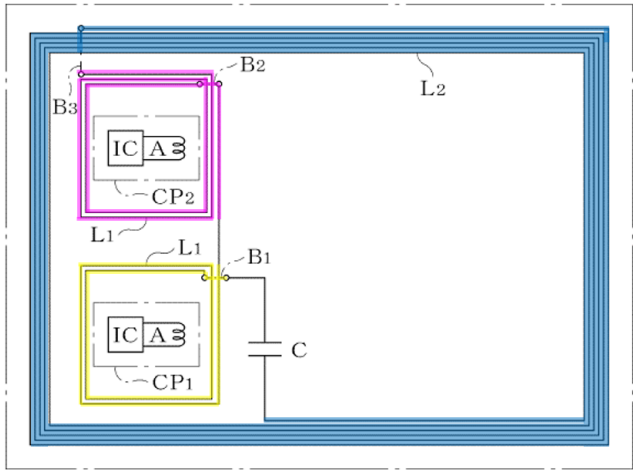
Patent Owner Agrees That an EA May Couple to a Chip

[7] Petitioner misapprehended the POR. *See* Reply, 1 ("AmaTech's argument relies on the strained proposition that a coil serving as an EA is not permitted to couple a chip to the BA…."), 4-8 (§ II.A.2, entitled "The EA is not precluded from coupling a chip to the BA"). Patent Owner never made any such argument. To the contrary, as explained below, the parties agree that the EA can inductively couple with the MA (which is connected to the chip).

-235 Sur-Reply, page 15 n.7

[7] Petitioner misapprehended the POR. *See* Reply, 19-20 ("AmaTech's recycled argument that an EA cannot couple to a chip fails again"). Patent Owner never made any such argument. To the contrary, as explained in this section, the parties agree that the EA can inductively couple with the MA (which is connected to the chip).

-417 Sur-Reply, page 11 n.7



Takeda-322 (Ex. 1005), FIG. 3 (annotated) (from -235 Petition, page 17)

Different Meanings for CC and EA

-235 Reply, pages 2-3
-417 Reply, pages 2-3

3. "Coupler Coil Component"

"Coupler coil component" appears in independent claims 1 and 5. The term also appears in the body of claim 2. The parties' proposed constructions are as follows:

Patent Owner	Petitioner
"a component in a booster antenna for coupling with a module antenna connected to an integrated circuit"	"a relatively small booster antenna component for coupling with the antenna of an antenna module"

-235 POR, page 29

≠

4. "Extension Antenna Component"

"Extension antenna component" appears in independent claims 1 and 5. The term also appears in the body of claim 2. The parties' proposed constructions are as follows:

Patent Owner	Petitioner
"a component connected to at least one of the card antenna component or the coupler coil component, and which enhances coupling between the module antenna and the booster antenna"	"an additional coil, disposed in available card space, that contributes to the booster antenna's inductance"

-235 POR, page 30

1. "Coupler Coil"

"Coupler coil" appears in independent claims 1 and 18. The term also appears in the body of claim 2, 7, and 11. The parties' proposed constructions are as follows:

Patent Owner	Petitioner
"a component in a booster antenna for coupling with a module antenna connected to an integrated circuit"	"a relatively small booster antenna component for coupling with the antenna of an antenna module"

-417 POR, page 15

≠

2. "Extension Antenna"

"Extension antenna" appears in independent claims 1 and 18. The term also appears in the body of claims 4-8, 11, and 12. The parties' proposed constructions are as follows:

Patent Owner	Petitioner
"a component which enhances coupling between the module antenna and the booster antenna"	"a booster antenna component that may comprise several turns (or traces) of wire (or other conductive material), may be connected (or not) in series with the card antenna and/or coupler coil, and contributes to the inductance of the booster antenna" and "an additional coil [aside from the coupler coil and card antenna] disposed in available card body space"

-417 POR, pages 16-17

APPLIED MEDICAL RESOURCES v. U.S. SURGICAL CORP.
Cite as 448 F.3d 1324 (Fed. Cir. 2006)

In other words, the use of two terms in a claim requires that they connote different *meanings*, not that they necessarily refer to two different *structures*. *Id.* The prosecution

Applied Med. Res. Corp. v. U.S. Surgical Corp., 448 F.3d 1324, 1333 n.3 (Fed. Cir. 2006) (cited at -235 Reply, page 5; -417 Reply, page 5)

Conclusion: An Extension Antenna Can Also Be a Coupler Coil

- Patent Owner's argument is refuted by intrinsic evidence:
  - "Combined CC/EA" in Figure 4F (Slides 25-29)
  - Prosecution History of the '932 Patent (Slides 13-14)
- Patent Owner said in Sur-Reply that an EA can inductively couple with a chip's antenna (Slide 30)

Patent Owner's Arguments About Takeda-322

- **An Extension Antenna Cannot Also Be a Coupler Coil**

  -235 POR, pages 39-45; -417 POR, pages 22-27

- **An Extension Antenna Must Enhance Coupling Between the Module Antenna of a Chip and the Booster Antenna**

  -235 POR, pages 22-23; -417 POR, pages 10-11

- **Petitioner Has Not Shown That Takeda-322's Inner Coil Non-Negligibly Contributes to the Booster Antenna's Inductance** -235 POR, pages 57-58; -417 POR, pages 38-39

- **Petitioner's Construction of "EA component" is Essentially Meaningless** -235 Sur-Reply, pages 7-10; -417 Sur-Reply, pages 7-10

Patent Owner Argues That an EA Must Enhance BA/MA Coupling

c. Petitioner Has Not Shown That Takeda-322's Alleged Extension Antenna (L_1-Top) Enhances Coupling between the Module Antenna and the Booster Antenna

As discussed above in § V.E.2, the extension antenna enhances coupling between the module antenna and the booster antenna. To be clear, the module antenna associated with the extension antenna is the same module antenna to which the coupler coil couples. *See* §§ V.C, V.E, VI.B.4, *supra*.

-235 POR, page 58

3. Petitioner Has Not Shown That Takeda-322's Alleged Extension Antenna (L_1-Top) Enhances Coupling between the Module Antenna and the Booster Antenna (Claims 1, 2, 4-8, 10-12, and 18)

As discussed above in § IV.E.1, the extension antenna enhances coupling between the module antenna and the booster antenna. To be clear, the module antenna associated with the extension antenna is the same module antenna to which the coupler coil couples. *See* §§ IV.C, IV.D, IV.E, *supra*. At most, Petitioner only argues that the alleged extension antenna inductively couples to a module antenna that does not inductively couple with the alleged coupler coil.

-417 POR, page 39

Patent Owner's Evidence of Enhancing BA/MA Coupling

Both Patents:

A "coupling area" (**144**) may be defined as the area immediately under the antenna module AM (and its module antenna (MA)). The coupler coil CC may be typically located in the coupling area. The extension antennas EA may be disposed in other than the coupling area, as discussed above, but nevertheless may enhance the overall coupling between the booster antenna BA and the module antenna MA, and/or the booster antenna BA and the antenna of an external reader.

'932 patent, 18:58-62 (cited at -235 POR, page 22; -235 Reply, page 8)
'250 patent, 16:34-41 (cited at -417 POR, page 10; -417 Reply, pages 9-10)

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Additionally, the extension antenna EA may increase the inductive coupling between the module antenna MA of the antenna module AM and the coupler coil CC of the booster antenna BA, and this may be more important than increasing the inductivity of the booster antenna BA. A high level of

'932 patent, 17:42-46 (cited at -235 POR, page 22; -235 Reply, page 8)

tactless reader (see FIG. 1) at around 20 mm. The extension antenna EA may increase the coupling factor between the coupler coil CC and the module antenna MA of the antenna module AM.

'932 patent, 18:44-47 (cited at -235 POR, pages 22-23; -235 Reply, page 8)

US 9,033,250 B2

or decreasing) pitch. The use of multiple extension antennas (EAs) allows for flexibility in the design of the extension antenna (EA) system in order to tune, including adjusting at least one of the inductance and the resonance frequency, of the booster antenna (BA). The use of multiple extension antennas (EAs) can ultimately improve the coupling between the booster antenna (BA) and the module antenna (MA).

'250 patent, 18:35-37 (cited at -417 POR, page 10; -417 Reply, pages 9-10)

Enhancing BA/MA Coupling Is Not Required

DECLARATION OF WILLIAM EISENSTADT, Ph.D.

b. The Extension Antenna Enhances Coupling between the Booster Antenna And the Module Antenna.

65. A POSA would understand that the extension antenna enhances overall coupling between the module antenna and the booster antenna. '932 patent, 18:58-61 ("The extension antennas [sic] EA … may enhance the overall coupling between the booster antenna BA and the module antenna MA….").

66. One of the ways that the extension antenna enhances coupling between the booster antenna and the module antenna is by increasing the inductive coupling between the module antenna and the coupler coil (which is part of the booster antenna). '932 patent, 17:42-46 ("Additionally, the extension antenna EA may increase the inductive coupling between the module antenna MA of the antenna module AM and the coupler coil CC of the booster antenna BA, and this may be more important than increasing the inductivity of the booster antenna BA."), 18:44-47 ("The extension antenna EA may increase the coupling factor between the coupler coil CC and the module antenna MA of the antenna module AM."). I have emphasized the words "more important" above, because it confirms to a POSA that enhancing coupling between the booster antenna and module antenna is a necessary feature of an extension antenna.

-235 Eisenstadt Decl. (-235 Ex. 2003), ¶¶ 65-66 (cited at -235 POR, 22-23)

DEPOSITION OF: WILLIAM EISENSTADT, Ph.D.

Q. Would you agree that enhancing coupling is not not necessarily required by the claim language?

MR. McBRIDE: Objection. Form.

THE WITNESS: I would agree that the claim language does not say enhancing coupling.

Eisenstadt Dep. (Ex. 1050), 91:17-21
(cited at -235 Reply, page 8; -417 Reply, page 9)

Q. So the three examples you gave here in paragraph 65 and 66, they're not requiring enhancing coupling for the extension antenna; is that fair?

A. Yeah.

Eisenstadt Dep. (Ex. 1050), 93:19-22; *see also id.* 91:23-93:18
(cited at -235 Reply, page 8; -417 Reply, pages 9-10)

Q. Does the patent say anywhere in the specification that enhancing coupling is a requirement for an extension antenna?

MR. McBRIDE: Objection. Vague.

THE WITNESS: Well, going -- not going out on a limb and saying that the three things I cited said it may enhance coupling and it doesn't say require, I suspect that it does not say it requires coupling in the actual verbiage of the patent specification.

Eisenstadt Dep. (Ex. 1050), 94:19-95:3
(cited at -235 Reply, pages 8-10; -417 Reply, pages 10-12)

Patent Owner's Expert Agreed

A "coupling area" (**144**) may be defined as the area immediately under the antenna module AM (and its module antenna (MA)). The coupler coil CC may be typically located in the coupling area. The extension antennas EA may be disposed in other than the coupling area, as discussed above, but nevertheless may enhance the overall coupling between the booster antenna BA and the module antenna MA, and/or the booster antenna BA and the antenna of an external reader.

'932 patent, 18:58-62 (cited at -235 POR, page 22; -235 Reply, page 8)
'250 patent, 16:34-41 (cited at -417 POR, page 10; -417 Reply, pages 9-10)

DEPOSITION OF:

WILLIAM EISENSTADT, Ph.D

THE WITNESS: I think -- I think I said that the -- providing negligible contribution of inductance -- providing contribution of inductance is one way it can be an extenstion antenna. The other way it would have to boost the -- it's in my -- I've answered before.

It would have to boost the coupling between the booster antenna and the antenna module, and it would have to be physically connected. So I can't just -- I

Eisenstadt Dep. (Ex. 1050), 90:16-23
(cited at -235 Reply, page 8; -417 Reply, page 10)

A. Okay. So in part B, "Extension antenna enhances coupling between booster and module antenna," page 27.

Okay. So in paragraph 66, which is supported by some references into the specification, "One of the ways the extension antenna enhances coupling between the booster antenna and module antenna is by increasing inductive coupling between the antenna module and the coupler coil," which is part of the booster antenna.

So the extension antenna can have -- although the space -- it's going to be an interesting design, but the extension antenna can be focused on increasing the capture of energy from the module antenna and not be focused on increasing the inductive total of the booster antenna. There's some examples in the specification.

Q. But it needs to do one of the two to be an extension antenna?

MR. McBRIDE: Objection. Vague.

MR. CORBETT: In your view.

MR. McBRIDE: Form. Scope.

THE WITNESS: I think it needs to do one or the other or both.

Eisenstadt Dep. (Ex. 1050), 75:19-76:17
(cited at -235 Reply, page 8; -417 Reply, page 10)

Patent Owner's New Argument in Sur-Reply

-235 Paper 32, page 4
-417 Paper 32, page 4

Before:

PATENT OWNER RESPONSE

Petitioner proposes that the "EA component is an additional coil, disposed in available card space, that contributes to the booster antenna's inductance." Petition at 4. Thus, there are three requirements under Petitioner's view for the extension antenna: (1) an additional coil (*i.e.*, in addition to the card antenna and coupler coil); (2) disposed in available card space; and (3) contributes to the inductance of the booster antenna. Each of these requirements is without substance, or undermined by Petitioner's own arguments. Ex. 2003, ¶ 78.

-235 POR, page 32

Petitioner's proposed construction is so broad as to capture literally any inductor (or fraction of an inductor) in a booster antenna. Thus, Petitioner's proposal is without meaning.

-235 POR, page 30

Thus, according to Petitioner, a component is an "extension antenna" if it: (1) is an additional coil beyond the coupler coil and card antenna; (2) is disposed in available card body space; (3) has several turns of wire; (4) is or is not connected in series with the card antenna and/or coupler coil; and (5) contributes to the inductance of the booster antenna. With the exception of #1, each of these characteristics are distinctions without a difference. Ex. 2003, ¶ 58.

-417 POR, page 19

Now:

SUR-REPLY

To be clear, as Dr. Eisenstadt explained in the quoted testimony above, there are two non-exclusive ways described in the '932 patent by which the EA enhances coupling between the BA and the module antenna: (1) increasing the inductive coupling between the module antenna and the coupler coil; and (2) contributing inductance to the BA. POR, 22; Ex. 2003, ¶¶ 65-67; Ex. 2028, ¶¶ 66-68. With

-235 Sur-Reply, page 18

To be clear, as Dr. Eisenstadt explained, there are two non-exclusive ways described in the '250 patent by which the EA enhances coupling between the booster antenna and the module antenna: (1) increasing the inductive coupling between the module antenna and the coupler coil; and (2) contributing inductance to the booster antenna. POR, 10-11; Ex. 2003, ¶¶ 49-51; Ex. 2028, ¶¶ 66-68. With respect to the

-417 Sur-Reply, page 14

"More Precisely Tuned" Citations in PO's Sur-Reply

The extension antenna EA may have two functions, firstly to lower the resonance frequency of the booster antenna BA to the desired resonance of 13.56 MHz from approximately 18.00 MHz, for example with only 10 windings (wire diam-

'932 patent, 18:36-39; '250 patent, 16:18-21
(corresponds to '304 patent, 18:59-62, cited at -417 Sur-Reply, page 13)

A benefit of having the extension antenna EA in a booster antenna BA may be to increase the inductivity of the booster antenna BA while reducing its resonance frequency. For example, without the extension antenna EA, the card antenna CA may require significantly more windings (such as in excess of 15 windings, instead of only 7 or 8 windings), depending on the spacing between the windings and the diameter or cross sectional area of the conductor of the wire used to form the booster antenna BA. It is within the scope of the invention that the card antenna CA has only one winding.

'932 patent, 17:32-41; '250 patent, 15:23-32
(corresponds to '304 patent, 17:52-62, cited at -417 Sur-Reply, page 13)

Metal Foil Layer(s)

The metal foil or metallic structure can advantageously alter (such as lower) the quality factor (Q) of the booster antenna (BA). The metal foil or metallic structure can also have a capacitive effect in the circuit. The presence of the metal foil or metallic structure in the card design can alter the electrical power delivered to the IC chip (CM). Some or all of these effects may enhance the performance of the RFID device or smartcard, improving the coupling between the antenna module AM and the coupler coil CC of the booster antenna BA. The communication between the RFID device or smartcard and the reader can thus be improved.

'932 patent, 43:3-13; no corresponding disclosure in '250 patent
(corresponds to '304 patent, 43:48-54, cited at -417 Sur-Reply, page 13)

Patent Owner's Arguments About Takeda-322

- **An Extension Antenna Cannot Also Be a Coupler Coil**

  -235 POR, pages 39-45; -417 POR, pages 22-27

- **An Extension Antenna Must Enhance Coupling Between the Module Antenna of a Chip and the Booster Antenna**

  -235 POR, pages 22-23; -417 POR, pages 10-11

- **Petitioner Has Not Shown That Takeda-322's Inner Coil Non-Negligibly Contributes to the Booster Antenna's Inductance** -235 POR, pages 57-58; -417 POR, pages 38-39

- **Petitioner's Construction of "EA component" is Essentially Meaningless** -235 Sur-Reply, pages 7-10; -417 Sur-Reply, pages 7-10

Patent Owner Argues That an EA's Contribution to the BA's Inductance Must Be Non-Negligible

-235 Reply, pages 10-12
-417 Reply, pages 13-14

US 9,195,932 B2

DISTINGUISHING OVER SOME OF THE PRIOR ART

booster antenna structure is arranged. The capacitor may also be configured as line capacitor and arranged, for example, as dummy turn. The dummy turn may have two conductor tracks extending next to one another, the winding direction of the two conductor tracks being opposite with respect to one another so that the dummy turn does not supply any or a negligible contribution to the inductance of the booster antenna structure.

'932 patent, 26:12-19 (cited at -235 POR, pages 48-49; -235 Reply, page 10)

US 9,033,250 B2

Distinguishing Over Some of the Prior Art

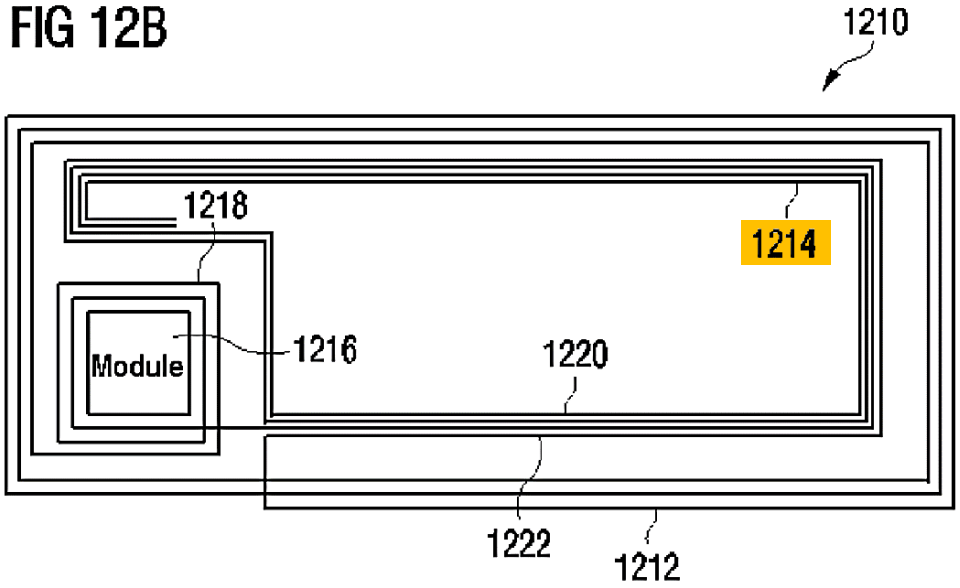
structure is arranged. The capacitor may also be configured as line capacitor and arranged, for example, as dummy turn. The dummy turn may have two conductor tracks extending next to one another, the winding direction of the two conductor tracks being opposite with respect to one another so that the dummy turn does not supply any or a negligible contribution to the inductance of the booster antenna structure. [0071]

'250 patent, 23:54-60 (cited at -417 Reply, pages 13-14; *see also* -417 POR, pages 21, 30, 38)

US 20130146671 (Infineon; 2013), discloses a booster antenna structure for a chip card, which may include an additional electrically conductive structure connected to the booster antenna. The additional electrically conductive structures disclosed therein are principally capacitive structures. FIG. **11**A (for example) shows a booster antenna structure with a finger capacitor. FIG. **12**A (for example) shows a booster antenna structure with a spiral capacitor. FIG. **12**B (for example) shows a booster antenna structure with a dummy turn as capacitor. FIG. 13A shows a meander shape

'932 patent, 25:60-26:2 (cited at -235 POR, page 49)

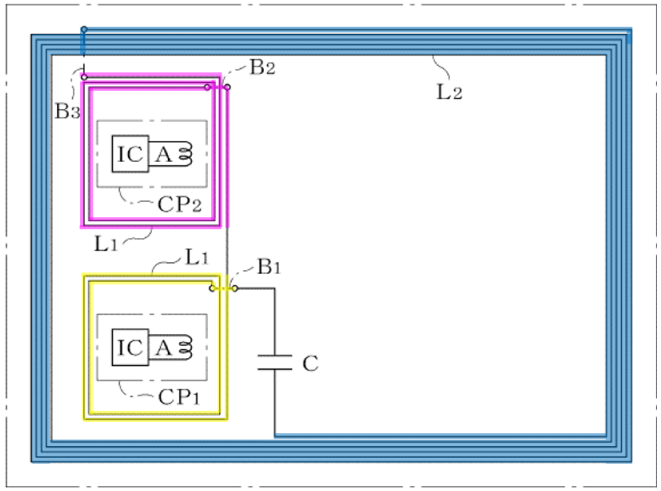
FIG 12B



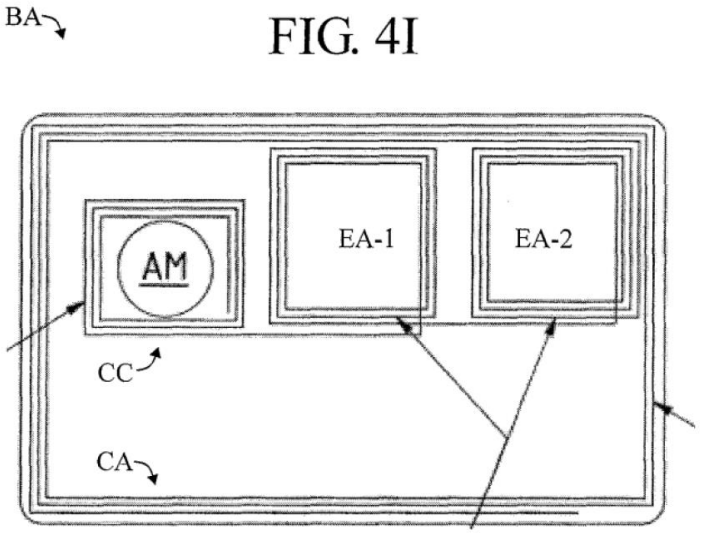
Takeda-322's Third Coil Is Not a Dummy Turn Capacitor

-235 Reply, pages 10-12
-417 Reply, pages 13-14

TAKEDA-322



Takeda-322 (Ex. 1005), FIG. 3 (annotated) (from -235 Petition, page 17)



'932 patent, FIG. 4I (cited at -235 Petition, page 18;
-235 POR, pages 14, 16, 18, 36, 43; -235 Reply, page 12)
'250 patent, FIG. 4I (cited at -417 Petition, pages 36, 80-81, 97;
-235 POR, pages 11-12, 27, 41; -235 Reply, pages 14, 17-19)

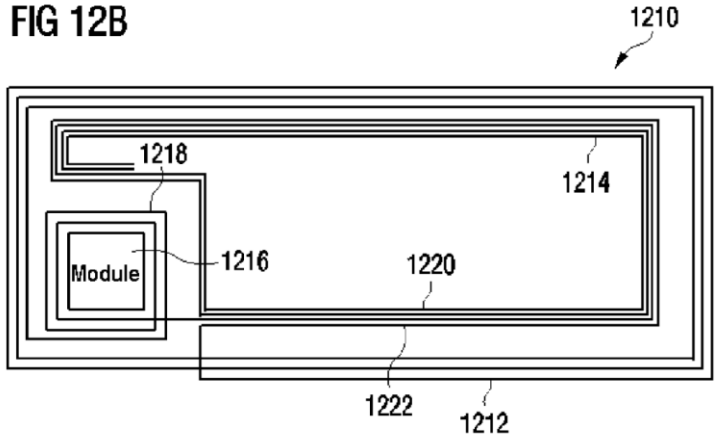


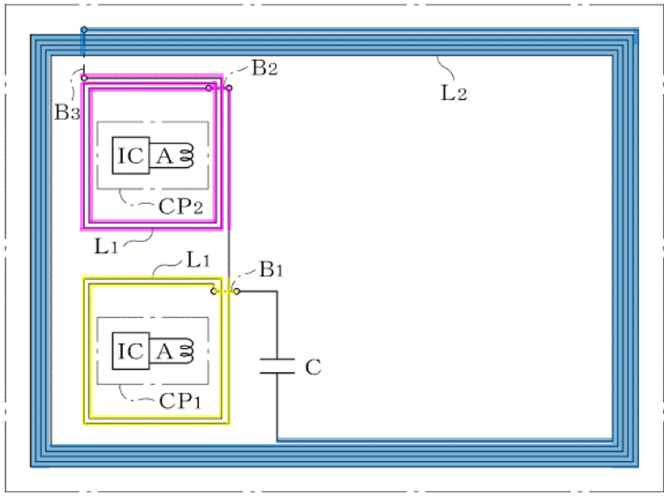
Figure 12B referenced at '932 patent, 25:60-26:2 (cited at -235 POR, page 49)

Takeda-322's Third Coil Contributes to the BA's Inductance

-235 Petition, pages 23-25
-417 Petition, pages 48-50

65. With respect to characteristic #5, literally any electrical component (or portion thereof) in a booster antenna contributes to the inductance of the booster antenna, including any length of the conductor itself or a subset of turns for a given antenna component. Further, Petitioner's proposal fails to account for the fact that the '250 patent expressly contemplates coils that supply only "negligible" contributions of inductance to the booster antenna. '250 patent, 23:58-60 ("The dummy turn… suppl[ies]… a negligible contribution of the inductance of the booster antenna structure.").

-417 Eisenstadt Decl. (-417 Ex. 2003 and -235 Ex. 1051), ¶ 65
(cited at -235 Reply, page 11; -417 POR, page 21; -417 Reply, page 14)



Takeda-322 (Ex. 1005), FIG. 3 (annotated)
(from -235 Petition, page 17)

[0015]
The booster coil and exciting coil formed as two-dimensional spirals can each realize a necessary inductance by being formed so as to have a predetermined number of turns. Moreover, by having the same winding direction, they can be easily formed by one conductive pattern and wire member.

Takeda-322 (Ex. 1005), [0015] (cited at -235 Petition, pages 14, 24-25;
-417 Petition, pages 13, 49-50, 58, 81)

[0022]
The card substrate CD is formed in a thin card shape by an insulating material such as a paper material or a synthetic-resin material. Embossing portions CD1, CD1 are formed on the card substrate CD to display a card number, a cardholder name, an expiration, and the like. The booster coil L2, the exciting coil L1, and the antenna coil La are each formed as a two-dimensional spiral conductive pattern on the card substrate CD by a technique such as printing or etching or by a wire member having an insulating coating.

Takeda-322 (Ex. 1005), [0022] (cited at -235 Petition, pages 19, 41;
-417 Petition, pages 18-19, 21, 23, 26-27)

Patent Owner's Expert was "Stuck" on whether Takeda-322's Coil's Contribution to the BA's Inductance was Negligible

-235 Reply, page 11
-417 Reply, page 14

Q. You use the word "negligible." How much of an inductive contribution is characterized as negligible?

MR. McBRIDE: Objection. Form.

BY MR. CORBETT:

Q. What does it mean to be negligible?

MR. McBRIDE: Objection. Form.

THE WITNESS: That's actually a humorous question, but --

BY MR. CORBETT:

Q. It is. You're right.

A. Give me a second.

Well, it's very hard to give you absolute numbers, but if -- I'll give you a practical sort of answer.

If I have a booster antenna that's working at the RFIC frequency of 13.56 megahertz and it's acceptable, it's got -- maybe it has 2 or 3 percent error, then -- so it depends on the error of that frequency -- then adding an antenna that does not detune it or move it away from that acceptable transmission frequency significantly so that it -- you know, it really is not functioning up to specification would be considered negligible.

And then I'd have to work through the whole system about what that number could be given all the other facts. So that's not -- that's not apparent. But the effect is that you want to receive from your reader at frequency well, and a negligible addition would not affect that.

Eisenstadt Dep. (Ex. 1050), 71:13-72:17
(cited at -235 Reply, pages 10-11; -417 Reply, pages 13-14)

Q. If you removed L1 top, would it still resonate at 13.56 megahertz?

MR. McBRIDE: Objection. Form. Incomplete hypothetical.

THE WITNESS: So I'm going to have to ask you what is left after you remove L1 top? I mean, is it disconnected, or what's there? Just nothing? Or wire? What's there?

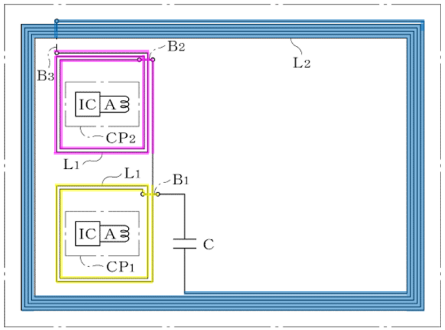
BY MR. CORBETT:

Q. I'd say a wire.

A. Just a wire? So, again, you know, if I look at the page 44, and I do remember a little bit of the specification of Takeda, the values of L1s are considerably less than L2. So I would suspect that it would resonate close to 13.56 megahertz, although not on it. So it depends upon what we call the queue of the system and how sharp the resonator is.

I can't do an exact analysis, but it could resonate the same. It could -- it could actually couple more if the loss -- if L2 top is not a big change. It could do more if L2 -- L1 top is large, then it could detune the resonator. I don't know. So I'm kind of stuck there.

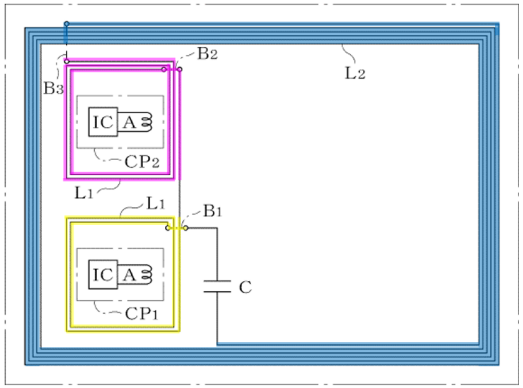
Eisenstadt Dep. (Ex. 1050), 113:24-114:22
(cited at -235 Reply, page 11; -417 Reply, page 14)



Takeda-322 (Ex. 1005), FIG. 3 (annotated)
(from -235 Petition, page 17)

Evidence That Takeda-322's EA Contributes Non-Negligibly to the BA's Inductance

-235 Petition, pages 14, 23-25
-417 Petition, pages 13, 48-50



Takeda-322 (Ex. 1005), FIG. 3 (annotated)
(from -235 Petition, page 17)

71. Takeda-322's booster coil L_2 is an outer coil—connected in series to the two inner coils in which the chips are disposed—that operates as an external antenna for each IC chip. Takeda-322, [0014]. Takeda-322's exciting coils L_1 are part of inner coils that each "act[s] as a secondary coil for the antenna of the IC chip [disposed within it] and exhibit[s] a signal-amplifying" function. Takeda-322, [0014]. The "booster coil and exciting coil formed as two-dimensional spirals can each realize a necessary inductance by being formed so as to have a predetermined number of turns." Takeda-322, [0015].

-235 van der Weide Decl. (-235 Ex. 1003), ¶ 71 (cited at -235 Petition, page 14); *see also* -417 van der Weide Decl. (-417 Ex. 1003), ¶ 67 (cited at -417 Petition, page 13, explaining same in context of '250 patent)

99. Takeda-322's upper inner coil (pink above) is an extension antenna component as described in the '932 specification. The upper inner coil comprises turns of wire, contributes to the inductance of the multi-coil antenna, and is connected in series with *both* the card antenna component (booster coil L_2 highlighted blue) and the coupler coil component (lower inner coil highlighted yellow) components and is a "continuation" and/or "extension" of those components. Takeda-322, [0014]-[0015] (teaching that upper exciting coil L_1 is a "two-dimensional spiral[]" with a "number of turns," which is "inductively coupled to the antenna of the IC chip" and can "realize a necessary inductance"), [0029]-[0030] (disclosing that upper exciting coil L_1 is connected in series with lower exciting coil L_1 and booster coil L_2), FIG. 3(B). These characteristics are comparable to the characteristics of extension antenna components described in the '932 patent, discussed above in ¶¶ 97-98.

-235 van der Weide Decl. (-235 Ex. 1003), ¶ 99 (cited at -235 Petition, page 24); *see also* -417 van der Weide Decl. (-417 Ex. 1003), ¶ 137 (cited at -417 Petition, pages 49-50, explaining same in context of '250 patent)

101. Additionally, based on the three coils in Takeda-322's multi-coil antenna, which are connected in "series" (Takeda-322, [0029]-[0030]), I understand (and a POSA would have understood) that *each* coil in Takeda-322's FIG. 3 embodiment—including the upper inner coil identified above as an extension antenna component—additively contributes to the inductance of Takeda-322's booster antenna. *See* Takeda-322, [0015] (teaching that the number of turns of each coil in Takeda-322 can be chosen to "realize a necessary inductance" in Takeda-322's multi-coil antenna). For documentary evidence corroborating the background knowledge of a POSA that adding inductors to a circuit in series contributes to the circuit's inductance, *see* Hayt (Exhibit 1013)[4], at 152-153.

-235 van der Weide Decl. (-235 Ex. 1003), ¶ 101 (cited at -235 Petition, page 25); *see also* -417 van der Weide Decl. (-417 Ex. 1003), ¶ 139 (cited at -417 Petition, page 50, explaining same in context of '250 patent)

Evidence That Takeda-322's EA Contributes Non-Negligibly to the BA's Inductance

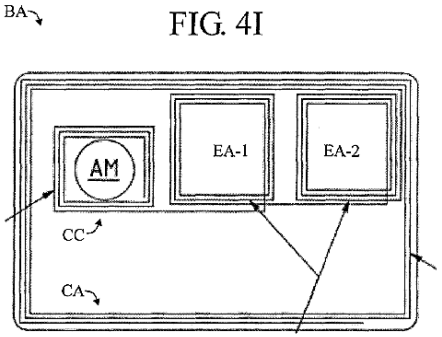
-235 Reply, pages 10-12
-417 Reply, pages 13-14

42. Additionally, Patent Owner argues that the Petition identified no evidence that the inductive contribution of coil L_1-top is non-negligible. POR, 57. This is wrong. The Petition cited Takeda-322, [0014]-[0015] (*see* Petition, 24-25)—which explains that the exciting coils (L_1-top and L_1-bottom) "each realize a necessary inductance" and "inductively couple[s]" a chip's antenna to the booster antenna. Neither Patent Owner nor Dr. Eisenstadt has any explanation for how a coil with sufficient inductance to inductively couple a booster antenna to a chip's module antenna could be considered to have "negligible" inductance.

43. Indeed, Patent Owner does not even argue that the Takeda-322 extension antenna component supplies a negligible contribution to the booster antenna's inductance. In another IPR proceeding between the parties—IPR2022-00417—Dr. Eisenstadt admits that "*any* electrical component (or portion thereof) in a booster antenna"—which Takeda-322's L_1-top is—"contributes to the inductance of the booster antenna." '250 Eisenstadt Dec. (Exhibit 1051), ¶ 65.

-235 van der Weide Reply Decl. (-235 Ex. 1055), ¶¶ 42-43 (excerpted) (cited at -235 Reply, pages 11-12); *see also* -417 van der Weide Reply Decl. (-417 Ex. 1055), ¶¶ 43-44 (cited at -417 Reply, pages 13-14, explaining same in context of '250 patent)

44. But a POSA would have understood that L_1-top—which is not a dummy turn and includes a cross-over ('932 patent, 26:14-19, 27:35-44)—non-negligibly contributes to the booster antenna's inductance. Indeed, its layout is commensurate with the coils in the '932 patent's FIG. 4I, which "shows two extension antennas EA-1 and EA-2." '932 patent, 46:64-65, FIG. 4I.



'932 patent, FIG. 4I

-235 van der Weide Reply Decl. (-235 Ex. 1055), ¶ 44 (cited at -235 Reply, pages 11-12); *see also* -417 van der Weide Reply Decl. (-417 Ex. 1055), ¶ 45 (cited at -417 Reply, page 14, explaining same in context of '250 patent)

[0014]
Likewise, by being inductively coupled to the antenna of the IC chip via the exciting coil, the booster coil can operate as the external antenna of the IC chip without a special wire connection. Note that the exciting coil can act as a secondary coil for the antenna of the IC chip and exhibit a signal-amplifying action according to a ratio of the number of turns had by each. However, the IC chip is disposed inside of the exciting coil so the antenna of the IC chip is inductively coupled to the exciting coil with sufficient closeness. Note that the exciting coil can be provided inside or outside of the booster coil.
[0015]
The booster coil and exciting coil formed as two-dimensional spirals can each realize a necessary inductance by being formed so as to have a predetermined number of turns. Moreover, by having the same winding direction, they can be easily formed by one conductive pattern and wire member.

Takeda-322 (Ex. 1005), [0014]-[0015] (cited, *e.g.*, at -235 Petition, pages 10, 14, 24-25; -235 Reply, page 11; -417 Petition, pages 8-9, 13, 49-50, 58, 80-81; -417 Reply, pages 13-14)

Patent Owner's Arguments About Takeda-322

- **An Extension Antenna Cannot Also Be a Coupler Coil**

  -235 POR, pages 39-45; -417 POR, pages 22-27

- **An Extension Antenna Must Enhance Coupling Between the Module Antenna of a Chip and the Booster Antenna**

  -235 POR, pages 22-23; -417 POR, pages 10-11

- **Petitioner Has Not Shown That Takeda-322's Inner Coil Non-Negligibly Contributes to the Booster Antenna's Inductance** -235 POR, pages 57-58; -417 POR, pages 38-39

- **Petitioner's Construction of "EA component" is Essentially Meaningless** -235 Sur-Reply, pages 7-10; -417 Sur-Reply, pages 7-10

Petitioner Used the Patents' Descriptions of an EA

-235 Reply, pages 3-4
-417 Reply, pages 3-5

The extension antenna (EA) contributes to the inductance of the booster antenna (BA), and may be in the form of a coil comprising at least one cross-over. The extension antenna

'932 patent, 5:52-53 (cited at -235 Petition, page 74; -235 Reply, pages 3, 9);
'250 patent, 5:36-37 (cited at -417 Petition, page 58; -417 Reply, page 11)

components). In the present invention, the antenna extension EA is in the form of a "true" coil, involves at least one crossover, and contributes to the inductance of the booster antenna BA.

'932 patent, 27:41-44 (cited at -235 Petition, pages 4, 24, 27, 74; -235 Reply, pages 9-10, 12); '250 patent, 23:67-24:3 (cited -417 Petition, pages 4, 49-50, 52, 58, 80-81; -417 Reply, pages 3, 11, 13-14)

As described in greater detail hereinbelow, according to an aspect of the invention, generally, an additional booster antenna component, referred to herein as an antenna extension (EA) component, may be disposed in remaining (or residual) area **148** of the surface of the card body CB. The antenna extension EA may comprise several turns (or traces) of wire (or other conductive material), and may be either (i) connected with one or both of the card antenna CA and coupler coil CC or (ii) not connected with either of the card antenna CA and coupler coil CC.

'932 patent, 10:59-67 (cited at -235 Petition, pages 4, 24; -235 Reply, pages 2-3);
'250 patent 9:27-36 (cited at -417 Petition, page 4; -417 Reply, page 3)

SUR-REPLY

To be clear, as Dr. Eisenstadt explained in the quoted testimony above, there are two non-exclusive ways described in the '932 patent by which the EA enhances coupling between the BA and the module antenna: (1) increasing the inductive coupling between the module antenna and the coupler coil; and (2) contributing inductance to the BA. POR, 22; Ex. 2003, ¶¶ 65-67; Ex. 2028, ¶¶ 66-68. With

-235 Sur-Reply, page 18

To be clear, as Dr. Eisenstadt explained, there are two non-exclusive ways described in the '250 patent by which the EA enhances coupling between the booster antenna and the module antenna: (1) increasing the inductive coupling between the module antenna and the coupler coil; and (2) contributing inductance to the booster antenna. POR, 10-11; Ex. 2003, ¶¶ 49-51; Ex. 2028, ¶¶ 66-68. With respect to the

-417 Sur-Reply, page 14

Dispute Regarding Meaning of EA

4. "Extension Antenna Component"

"Extension antenna component" appears in independent claims 1 and 5. The term also appears in the body of claim 2. The parties' proposed constructions are as follows:

Patent Owner	Petitioner
"a component connected to at least one of the card antenna component or the coupler coil component, and which enhances coupling between the module antenna and the booster antenna"	"an additional coil, disposed in available card space, that contributes to the booster antenna's inductance"

-235 POR, page 30

3. Petitioner's construction of "EA component" is essentially meaningless

Patent Owner believed that Petitioner construed "EA component" to mean "an additional coil, disposed in available card space, that contributes to the booster antenna's inductance." *See* POR, 30, 32; Ex. 2003, ¶ 78. Patent Owner's

-235 Sur-Reply, page 7

2. "Extension Antenna"

"Extension antenna" appears in independent claims 1 and 18. The term also appears in the body of claims 4-8, 11, and 12. The parties' proposed constructions are as follows:

Patent Owner	Petitioner
"a component which enhances coupling between the module antenna and the booster antenna"	"a booster antenna component that may comprise several turns (or traces) of wire (or other conductive material), may be connected (or not) in series with the card antenna and/or coupler coil, and contributes to the inductance of the booster antenna" and "an additional coil [aside from the coupler coil and card antenna] disposed in available card body space"

-417 POR, pages 16-17

3. Petitioner's and its expert's construction of "EA" is essentially meaningless

Patent Owner believed that Petitioner construed "EA" to mean "an additional coil," "disposed in available card body space," that "contributes inductance to the booster antenna." *See* POR, 16-17. This belief was based on Petitioner's express

-417 Sur-Reply, page 7

Petitioner Did Not Need to Provide an Outer-Boundary Construction

-235 Petition, pages 9, 23-25, 73-75
-417 Petition, pages 8, 48-50, 78-82

NIDEC MOTOR CORP. v. ZHONGSHAN BROAD OCEAN MOTOR
Cite as 868 F.3d 1013 (Fed. Cir. 2017)

First, Nidec argues that the Board wrongly construed the term "HVAC system" in the claim preambles to be non-limiting. J.A. 21. Whether or not Nidec is correct, the result does not change. The Board specifically addressed the issue by stating, "[o]ur conclusion would be unaffected by a determination that the preambles of the claims reciting an HVAC system are limiting. Although Kocybik is not directed specifically to HVAC systems, Petitioner relies on Bessler for such a teaching." J.A. 34 n.10. There is no dispute that Bessler teaches an HVAC system as recited in the claims. Because we need only construe terms "that are in controversy, and only to the extent necessary to resolve the controversy," *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999), we need not construe the claim preambles here where the construction is not "material to the [obviousness] dispute," *id.* We see no error in the Board's decision in this regard.

Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co., 868 F.3d 1013, 1017 (Fed. Cir. 2017)
(cited at -235 Petition, page 9; -417 Petition, page 8)

Federal Register / Vol. 83, No. 197

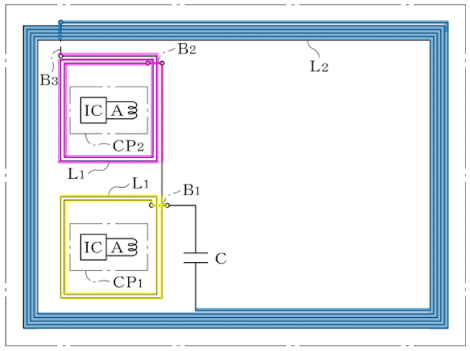
Response: In this final rule, the Office fully adopts the federal courts claim construction standard, which is articulated in *Phillips,* for interpreting claims in AIA proceedings. This rule reflects that the PTAB in an AIA proceeding will apply the same standard applied in federal courts to construe patent claims.

83 Fed. Reg. 51,340, 51,352 (Oct. 11, 2018) (cited at -235 Sur-Reply, page 3; -417 Sur-Reply, pages 3-4).

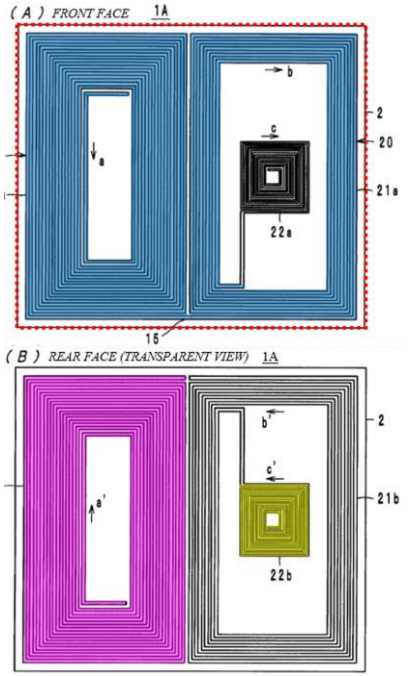
Federal Register / Vol. 83, No. 197

Moreover, it also may not be necessary to determine the exact outer boundary of claim scope because only those terms that are in controversy need be construed, and only to the extent necessary to resolve the controversy (*e.g.,* whether the claim reads on a prior art reference). *See Nidec Motor Corp.* v. *Zhongshan Broad Ocean Motor Co. Ltd.,* 868 F.3d 1013, 1017 (Fed. Cir. 2017)

83 Fed. Reg. 51,340, 51,353 (Oct. 11, 2018) (cited at -235 Petition, page 9; -417 Petition, page 8).

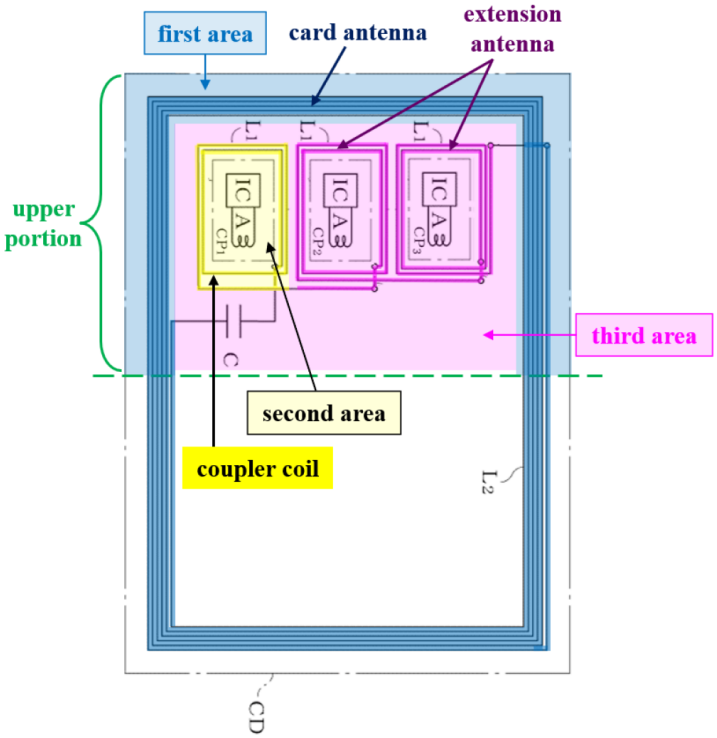


Takeda-322 (Ex. 1005), FIG. 3 (annotated)
(from -235 Petition, page 17)

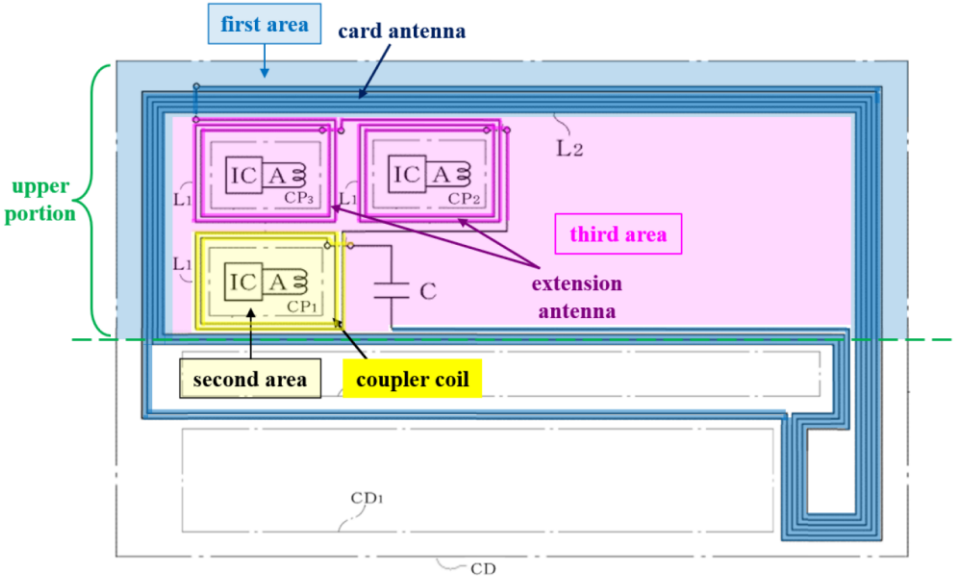


Murayama (-235 Ex. 1007), FIG. 1 (annotated)
(from -235 Petition, page 76)

Two-Coil Extension Antennas in Takeda-322



Obvious Portrait-Orientation (with CP_3)



Obvious Embossed Implementation (with CP_3)

Annotated figures from -417 Petition, page 79; *see also* -417 Reply, page 15

The -417 Petition Analyzed Two-Coil Extension Antennas

10. Claim 12

Claim 12 depends from claim 1 and recites that "the extension antenna (EA) comprises at least two coils (EA-1, EA-2)."

-417 Petition, page 70

c. All the Obvious Implementations of Takeda-322 FIG. 3 with Three IC Chips Have an EA with at Least Two Coils as Claim 12 Requires

-417 Petition, page 78

The two coils highlighted dark pink below are collectively an extension antenna that comprises at least two coils as claim 12 requires, and both are "disposed in the third area" (shown in light pink below and discussed *supra* § VI.B.1.f), as required by claim 1 from which claim 12 depends. *Id.*

-417 Petition, page 78

The limitations of claim 18 other than those related to the EA are identical (or substantively similar) to limitations in claim 1. Other than having a two-coil EA, the Obvious Implementations of Takeda-322 FIG. 3 with three IC chips and exciting coils have the same components as the Obvious Implementations of Takeda-322 FIG. 3 (with two IC chips and exciting coils) that were mapped to claim 1. VDW, ¶ 222. Thus, for the limitations of claim 18 other than those

-417 Petition, page 84

As discussed *supra* §§ VI.B.10.c-d, in all the Obvious Implementations of Takeda-322 FIG. 3 with three IC chips described *supra* §§ VI.B.10.a(1)-(4), the card body "CD" comprises an EA collectively formed by the inner coil associated with CP_2 (labeled EA-1 below) and the inner coil associated with CP_3 (labeled EA-2 below), and that EA "comprises at least two coils (EA-1, EA-2); wherein the extension antenna (EA) comprises a first coil (EA-1) and a second coil (EA-2)," as claimed. VDW, ¶ 231.

-417 Petition, pages 92-93

The Patents Make No Distinction Between Two-Coil EAs and Two EAs

-417 Reply, pages 18-19

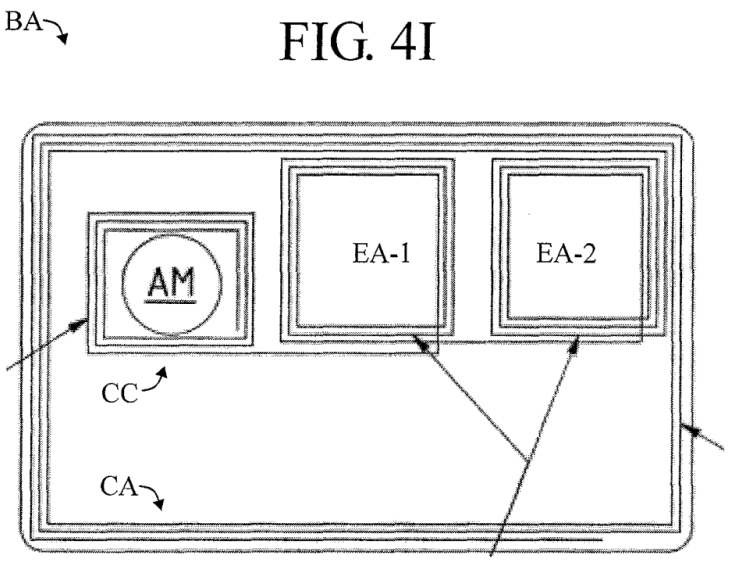
FIG. 4I is an illustration of a booster antenna (BA) with card antenna CA, a coupler antenna (CC) and an extension antenna (EA). The antenna may be laid on the card body CB as a continuous embedded coil.

The extension antenna EA comprises two coils EA-1 and EA-2 which may be connected in series with one another, as shown. One end of the coil EA-1 is connected with an end of the coupler coil CC, the other end of the coupler coil CC may be a free end. The other end of the coil EA-1 is connected with a first end of the coil EA-2. The other end of the coil EA-2 is connected with an end of the card antenna CA, the other end of the card antenna CA may be a free end. The two coils EA-1 and EA-2 of the extension antenna EA may be laid with the same sense (both clockwise), or with opposite senses (one clockwise, the other counter clockwise).

'250 patent, 18:12-37 (cited at -417 Reply, page 18)
'932 patent, 20:39-49 (cited at -417 Reply, page 18)

FIG. 15B shows an embodiment of a booster antenna BA having a card antenna CA component, a coupler coil CC component, and an extension antenna EA component. In this example, the extension antenna EA component is shown having inner and outer windings. Compare FIG. 4I which shows two extension antennas EA-1 and EA2. This illustrates that a given component (CA, CC, EA) of a booster antenna BA may have two or more windings which may be, but need not necessarily be arranged as inner and outer (IW/OW, iw/ow, IP/OP) windings. And, although the booster antenna BA in this example is shown without and free ends, it should be understood that any of the components (CA, CC, EA, as well as CE) may have at least one free end.

'932 patent, 46:64-65 (cited at -417 Reply, page 18)



'932 patent, FIG. 4I (cited at -235 Petition, page 18; -235 POR, pages 14, 16, 18, 36, 43; -235 Reply, page 12)
'250 patent, FIG. 4I (cited at -417 Petition, pages 36, 80-81, 97; -235 POR, pages 11-12, 27, 41; -235 Reply, pages 14, 17-19)

Dr. van der Weide Meets Patent Owner's POSA Definition

Second, Petitioner's expert has experience at lower frequencies and easily meets (indeed exceeds) AmaTech's too-narrow POSA definition. He:

- co-founded Elucent Medical, which uses low-frequency RFID antennas employing inductive coupling. Ex. 1004, 13; Ex. 2018, 17:5-17.
- studied RFID antennas employing inductive coupling at low frequencies as part of a 2008-2009 NSF Research Grant. Ex. 1004, 3.
- ***supervised*** a POSA under AmaTech's definition in 2005. *Id.*, 9 (Douglas Lagally, near-field magnetic antennas); Eisenstadt-Dep., 54:22-55:21.
- taught courses demonstrating inductive coupling of planar coils. Ex. 1004, 9-10 (ECE340, ECE420, ECE447).
- is an inventor on patents with RFID antennas operable at 13.56 MHz, including U.S. Patent Nos. 9,730,764; 9,987,097; 10,154,799; 10,278,779; and 11,344,382. Ex. 1004, 37 (describing patent search).
- has consulted as an expert on inductively-coupling smart cards in multiple patent litigations. VDW-Reply, ¶ 62.

-417 Reply, pages 22-23 (citing -417 van der Weide Reply Decl. (-417 Ex. 1055), ¶ ¶ 61-62); *see also* -235 Reply, pages 25-26 (citing -235 van der Weide Reply Decl. (-235 Ex. 1055), ¶ ¶ 100-101)

Patent Owner's Attacks on Dr. van der Weide

-235 Reply, pages 1, 27
-417 Reply, pages 2, 24

However, Petitioner's expert could not explain how, in his view, the coupler and coil were combined in FIG. 4F—*e.g.*, whether they are brought together without mixing, intermixed, or coextensive. Ex. 2018 at 128:11-135:6 (generally), 129:3-19 ("**Q**. … What does the English word 'combined' mean to you? **A**. … "Brought together as one. **Q**. So 'brought together as one.' Let's say I have a lump of red Play-Doh and a lump of blue Play-Doh, okay? If I mash them together, without doing more, are those Play-Doh lumps combined? **A**. Well, that's well outside the scope and context of the 932 patent, so I haven't given that any thought."), 129:20-

-235 POR, page 42; -417 POR, page 25

Q. I don't understand your understanding of "combined." Maybe you can help me out? What does the English word "combined" mean to you?

A. In this context, it means these two elements that are discussed as distinct elements in the specification are essentially combined with one another as a coil. So combined. Brought together as one.

Q. So "brought together as one." Let's say I have a lump of red Play-Doh and a lump of blue Play-Doh, okay? If I mash them together, without doing more, are those Play-Doh lumps combined?

A. Well, that's well outside the scope and context of the 932 patent, so I haven't given that any thought. I'm not sure that I would -- I'd have to give that some thought as to whether the word "combined" would, in the same sense that it's being used here in my citation to column 19, would apply in that hypothetical Play-Doh example.

Q. So what about if the Play-Doh example of the red and blue Play-Doh, they were thoroughly mixed together such that it resulted in a larger purple blob? Would those -- would the red and blue Play-Doh be combined in that example?

van der Weide Dep. (Ex. 2018), 129:3-23
(cited at -235 POR, page 42; -417 POR, page 25)

THE WITNESS: The use of the term "combined" in the hypothetical of this question is so far outside the bounds of the disclosure of the 932 and its coupler coil and extension antenna coil that it is very difficult to opine as I sit here today.

van der Weide Dep. (Ex. 2018), 130:1-5
(cited at -235 POR, page 42; -417 POR, page 25)

Murayama Grounds

Murayama Describes a Compound Antenna for an RFID Chip

MURAYAMA

Title of the Invention: COMPOUND ANTENNA AND COMPOUND WIRELESS COMMUNICATION DEVICE

TECHNICAL FIELD

[0001] The present invention pertains to compound antennas and compound wireless communication devices, and, in particular, to a compound antenna that resonates in two different frequency bands, and a compound wireless communication device provided with said compound antenna.

Murayama (-235 Ex. 1007), [0001] (cited at -235 Petition, pages 61-62)

[0027] As described above, the coupling of the wireless communication element 30 to the second antenna 20 results in the compound antenna 1A being configured as a wireless communication device (wireless IC tag) that communicates with a reader-writer of an RFID system. The wireless communication element 30 can be omitted to create an anti-theft tag that uses only the first antenna 10. In other words, the wireless communication element 30 can be added later, and it is possible to prepare only the compound antenna 1A and add on RFID tag functionality as necessary.

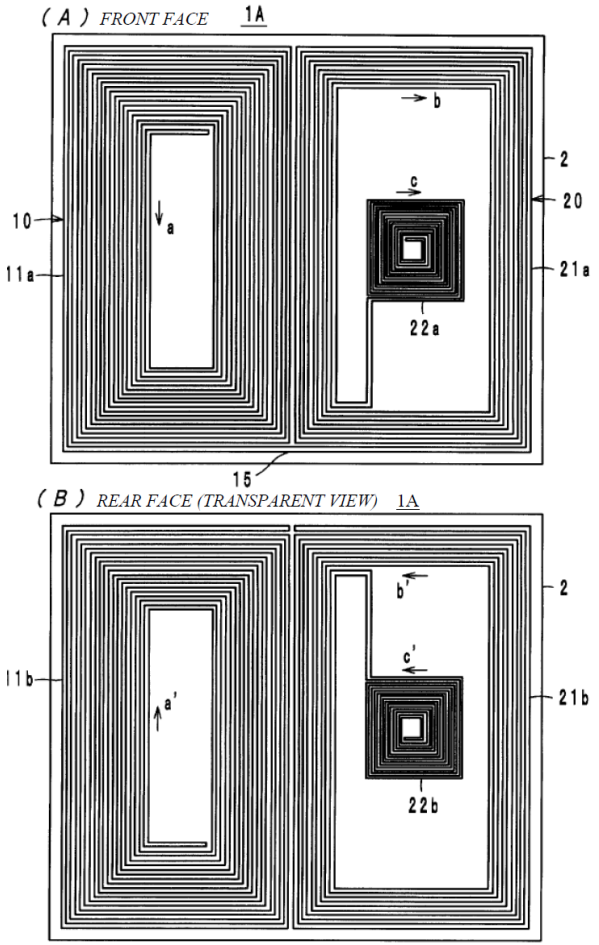
Murayama (-235 Ex. 1007), [0027] (cited at -235 Petition, pages 62, 64-66, 84)

US 9,195,932 B2

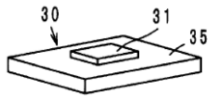
A Compound Booster Antenna (BA)

FIGS. **5**F,G,H illustrate forming two booster antennas, each having a partial coupler coil, in two different planes, such as one booster antenna on each of two opposite sides of the card body (substrate), or on two separate layers which may then be laminated together.

'932 patent, 22:49-62 (cited -235 Petition, pages 4-5, 65-66, 68, 71, 74)



Murayama (-235 Ex. 1007), FIG. 1
(cited at, *e.g.*, -235 Petition, pages 62-64)



Murayama (-235 Ex. 1007), FIG. 2
(cited at -235 Petition, page 65)

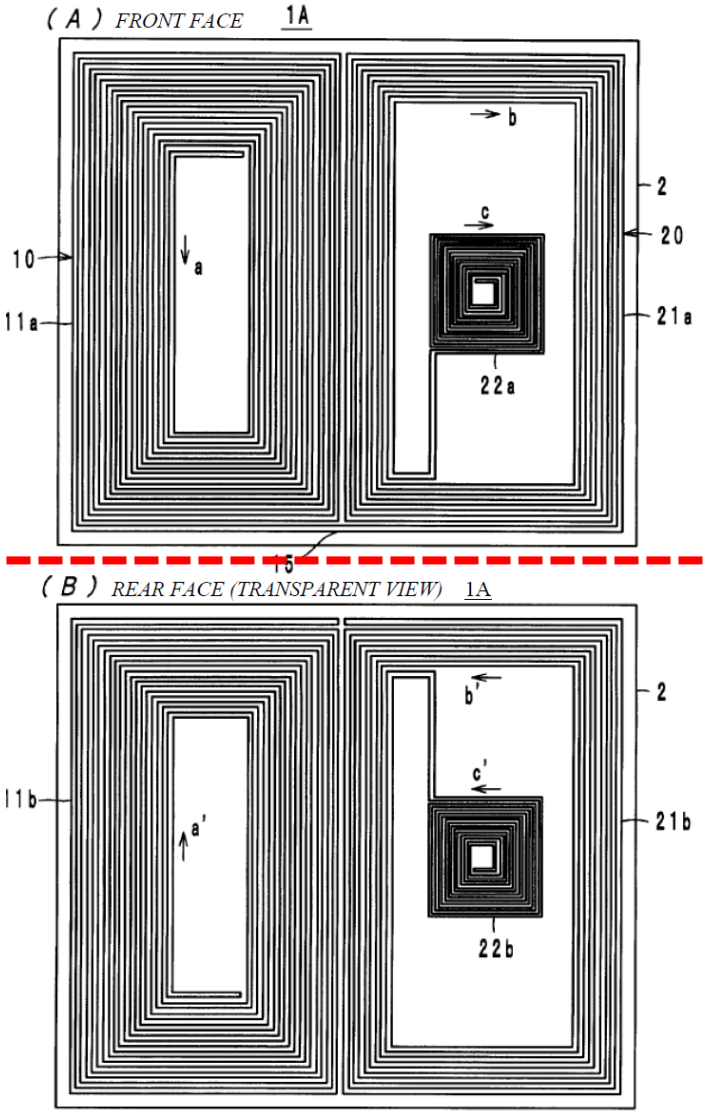
Murayama's Compound Antenna Has Components on Two Sides of a Card

208. I understand (and a POSA would have understood) that when Murayama's wireless card is formed, the bottom of FIG. 1(A) is aligned with the top of FIG. 1(B), with the faces arranged as if FIG. 1 were folded about a horizontal line between the (A) view and the (B) view. I further understand (and a POSA would have understood) that when the faces shown in FIG. 1 are arranged in this manner, the opposing electrodes (11a/11b, 21a/21b, and 22a/22b) on the front and rear faces are near mirror images resulting in current flowing in the same direction in each electrode pair (11a/11b, 21a/21b, and 22a/22b), as Murayama teaches. Murayama, [0014] ("current flows through the first and second coiled electrodes 11a, 11b in the same direction "), [0015] ("current flows through the first and second coiled electrodes 21a, 21b in the same direction"). Indeed, if the two faces were, for example, overlayed (*i.e.*, stacked) *without* any rotation of either face, I understand (and a POSA would have understood) that the conductive elements in Murayama would not have lined up and the currents in Murayama's electrodes would not have flowed in the same direction, as taught. Murayama, [0014].

-235 van der Weide Decl. (-235 Ex. 1003), ¶ 208 (cited at -235 Petition, page 64)

[0016] The first antenna 10 and the second antenna 20 are electrically connected on the front face of the substrate 2. This connecting part 15 is a single peripheral location at which the first coiled electrode 11a of the first antenna 10 and the first coiled electrode 21a of the second antenna 20 are adjacent. The first antenna 10 and the second antenna 20 are not (DC) electrically connected on the rear face of the substrate.

Murayama (-235 Ex. 1007), [0016] (cited at -235 Petition, pages 64, 68, 72, 74)



Murayama (-235 Ex. 1007), FIG. 1
(cited at, *e.g.*, -235 Petition, pages 62-64)

Murayama's Compound Antenna Boosts the Communication Range for an RFID Chip

[0024] Meanwhile, the second antenna 20 forms a resonant circuit through the inductance of the first and second coiled electrodes 21a, 21b and the capacitance formed by the electrodes 21a, 21b being disposed opposing each other, and resonates in a second frequency band (for example, the 13.56 MHz band) that is higher than the first frequency band, thereby functioning as a magnetic field antenna. The first and second coupling parts 22a, 22b are magnetically coupled to the power supply circuit board 35 forming part of the wireless communication element 30.

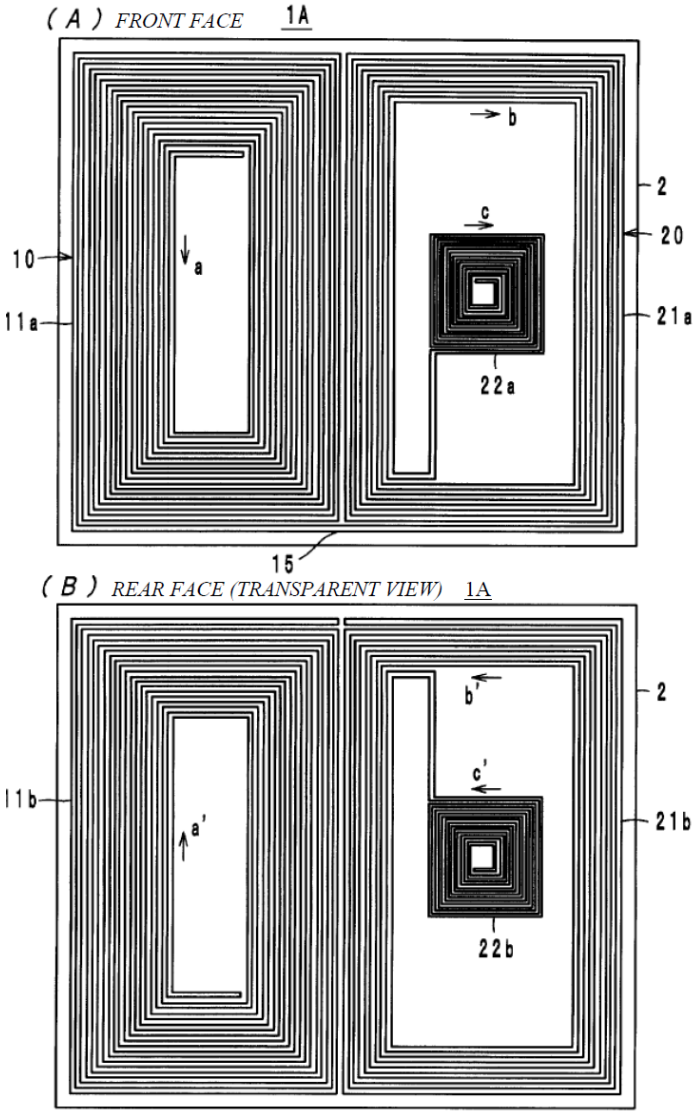
Murayama (-235 Ex. 1007), [0024] (cited at -235 Petition, pages 66, 71-72)

[0026] When the second antenna 20 is operating, second-frequency-band current flows to the first antenna 10 due to the first antenna 10 being electrically connected to the second antenna 20 via the connecting part 15, and the magnetic fluxes in the loop axial directions of the antennas 10, 20 reinforce each other. However, the first antenna 10, which resonates in the first frequency band lower than the second frequency band, does not resonate from the second-frequency-band current, and acts as a distributed capacitive component; thus, current flows in the first antenna 10 so as to form a magnetic field in the same direction as the second antenna 20. This increases the range over which the magnetic field is emitted, causing the first antenna 10 to function as a boost antenna when the second antenna 20 is operating. As a result, gain in the second frequency band is improved. Incidentally, forming the first antenna 10 and the second antenna 20 to have identical shapes as in the first example resulted in a communication range at 13.56 MHz that was at least 1.5 times greater than when the second antenna 20 was operated alone.

Murayama (-235 Ex. 1007), [0026] (cited at -235 Petition, pages 65-66, 74)

[0027] As described above, the coupling of the wireless communication element 30 to the second antenna 20 results in the compound antenna 1A being configured as a wireless communication device (wireless IC tag) that communicates with a reader-writer of an RFID system. The wireless communication element 30 can be omitted to create an anti-theft tag that uses only the first antenna 10. In other words, the wireless communication element 30 can be added later, and it is possible to prepare only the compound antenna 1A and add on RFID tag functionality as necessary.

Murayama (-235 Ex. 1007), [0027] (cited at -235 Petition, pages 62, 64-66, 84)



Murayama (-235 Ex. 1007), FIG. 1
(cited at, *e.g.*, -235 Petition, pages 62-64)

The Claims Impose No Frequency Requirements

US 9,195,932 B2

1. A booster antenna (BA) comprising a card antenna (CA) component extending around a periphery of a card body (CB), a coupler coil (CC) component disposed at a coupling area of the card body (CB) corresponding to an antenna module (AM), and an extension antenna (EA) component, characterized by:

the extension antenna (EA) component has a sense opposite to that from the card antenna (CA) component.

'932 patent, claim 1

5. Booster antenna (BA) comprising the following components:

a card antenna (CA) component;

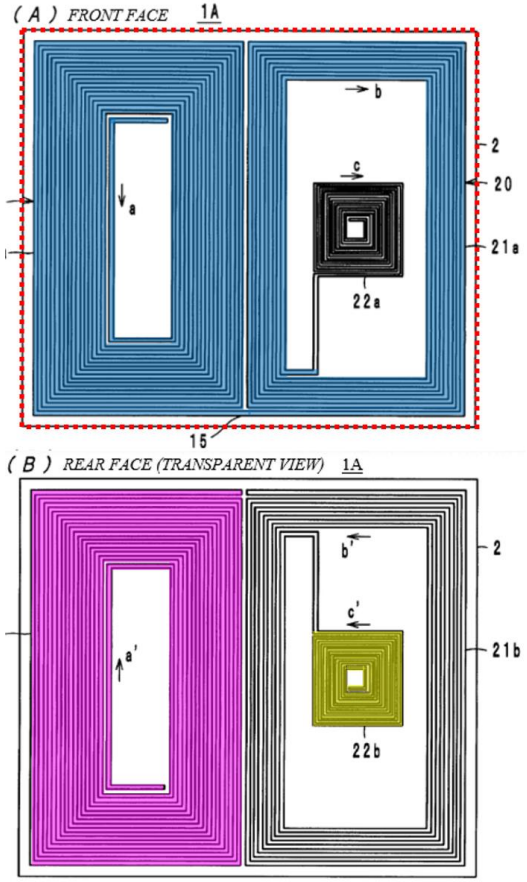
a coupler coil (CC) component; and

an extension antenna (EA) component;

characterized in that:

at least one of the components has a sense which is opposite one or more of the other components.

'932 patent, claim 5



Murayama (-235 Ex. 1007), FIG. 1 (annotated)
(from -235 Petition, page 76)

PO's "Single Resonance Frequency" Argument

-235 POR, page 64

3. Petitioner Has Not Shown That Murayama Discloses a Booster Antenna

As explained in § VI.B.1, "booster antenna" should be construed to mean "an antenna tuned to a single resonance frequency that enables a chip to communicate with an external reader." Petitioner has mixed various components of Murayama's first and second antennas 10, 20 to allege a disclosure of the booster antenna. The Petition illustrates how the alleged booster antenna is cobbled together from the first antenna 10 (electrodes 11a, 11b) and the second antenna 20 (electrodes 21a, 22a).

-235 POR, page 64

1. Overview of Murayama

Murayama discloses a wireless card that purportedly can operate in two distinct frequency bands, such that one card can work with different RFID systems (*i.e.*, different external card readers). Ex. 1007, ¶ 3. Murayama discloses a single

-235 POR, page 60

Booster Antennas Tuned to Multiple Frequencies Were Known

58. Another example is Koyama (Exhibit 1053), which describes a "booster antenna 1321" through which "different frequencies of signals" may "be transmitted and received," thereby allowing "the semiconductor device shown in FIG. 13" to be "used for wireless signals of a plurality of frequencies." Koyama, 18:4-20:13, FIGs. 13-14 (reproduced below). Koyama specifically says this embodiment may be used in "the shortwave band (e.g., the 13.56 MHz band)." Koyama, 19:38-49.

-235 van der Weide Reply Decl. (-235 Ex. 1055), ¶ 58 (cited at -235 Reply, page 13)

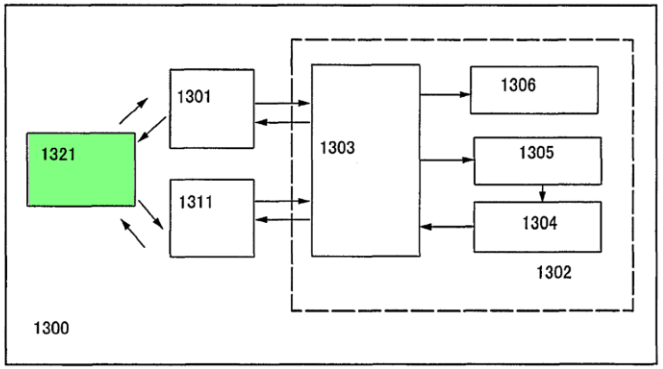
Koyama et al.
US 8,816,484 B2

The structure of the semiconductor device shown in FIG. **13** is different from the structure of the semiconductor device shown in FIG. **8** in that a plurality of antennas are included. Accordingly, different frequencies of signals to be transmitted and received through the booster antenna **1321** can be employed for the first antenna **1301** and the second antenna **1311**. Thus, the semiconductor device shown in FIG. **13** can be used for wireless signals of a plurality of frequencies. Note that the semiconductor device shown in FIG. **13** is not limited to have a structure in which the first antenna **1301** and the second antenna **1311** are provided for one integrated circuit portion **1302**, and the semiconductor device of the invention may include three or more antennas.

Next, FIG. **14** is a schematic top plan view of the structure shown in FIG. **13** in this embodiment mode.

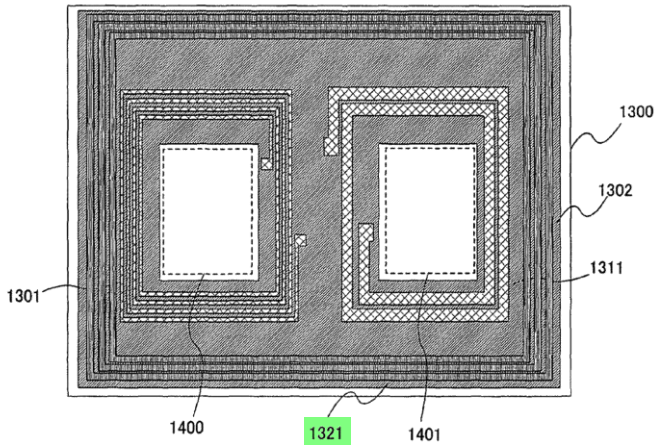
Koyama (-235 Ex. 1053) (cited at -235 Reply, page 13), 18:28-42; -235 van der Weide Reply Decl. (-235 Ex. 1055), ¶ 58 (cited at -235 Reply, page 13)

FIG. 13



Koyama (-235 Ex. 1053) (cited at -235 Reply, page 13), FIG. 13; -235 van der Weide Reply Decl. (-235 Ex. 1055), ¶ 58 (cited at -235 Reply, page 13)

FIG. 14



Koyama (-235 Ex. 1053) (cited at -235 Reply, page 13), FIG. 14; -235 van der Weide Reply Decl. (-235 Ex. 1055), ¶ 58 (cited at -235 Reply, page 13)

The Specification Does Not Redefine "Booster Antenna"

-235 Reply, pages 13-14

C. "BA"

Petitioner argues that "booster antenna" was a known term, and Patent Owner did not dispute that the term was not redefined by the '932 patent. While it is true that some booster antennas were known, Patent Owner absolutely disputed the term's meaning in the context of the '932 patent. POR, 26-28. A POSA would recognize that the '932 patent teaches a new type of booster antenna that is not identical to those so-labeled in the prior art. *See* '932 patent, Title ("BOOSTER ANTENNA CONFIGURATIONS AND METHODS"), Abstract ("A booster antenna (BA) for a smart card comprises…."), claim 1 ("A booster antenna (BA) comprising… an extension antenna (EA) component….").[11]

-235 Sur-Reply, pages 19-20

CONTINENTAL CIRCUITS LLC v. INTEL CORP.
Cite as 915 F.3d 788 (Fed. Cir. 2019)

F.3d at 979). Our case law has recognized that "the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess." *Id.* at 1316. When the patentee acts as its own lexicographer, that definition governs. *See id.* "To act as its own lexicographer, a patentee must 'clearly set forth a definition of the disputed claim term' other than its plain and ordinary meaning." *Thorner v. Sony*

Continental Circuits LLC v. Intel Corp., 915 F. 3d 788, 796-97 (Fed. Cir. 2019) (cited at -235 Reply, page 15)

The Alleged Invention Is Not Limited to the Specification's Embodiments

-235 Reply, pages 13-15

> The '932 patent explains repeatedly that the booster antenna has a single resonance frequency. *See, e.g.*, '932 patent, 17:32-34 ("[booster antenna's]

-235 POR, page 27

> frequency"). Nowhere does the '932 patent disclose a booster antenna tuned to multiple resonance frequencies. Ex. 2003, ¶ 71. Moreover, Petitioner agrees that

-235 POR, page 27

HILL–ROM SERVICES, INC. v. STRYKER CORP.
Cite as 755 F.3d 1367 (Fed. Cir. 2014)

F.2d 1367, 1384 (Fed.Cir.1986). The absence of an embodiment teaching a wireless receiver does not prevent the claimed datalink from being given its plain and ordinary meaning at the relevant time.

Hill-Rom Servs. v. Stryker Corp., 755 F.3d 1367, 1373 (Fed. Cir. 2014) (cited at -235 Reply, page 14)

> Although the invention is generally described in the context of various exemplary embodiments, it should be understood that it is not intended to limit the invention to these particular embodiments, and individual features of various embodiments may be combined with one another. Any text

'932 patent, 7:18-22 (cited at -235 Reply, page 15)

> example, FIGS. 3A-3D therein. The present invention is not limited to any particular one(s) of these configurations.

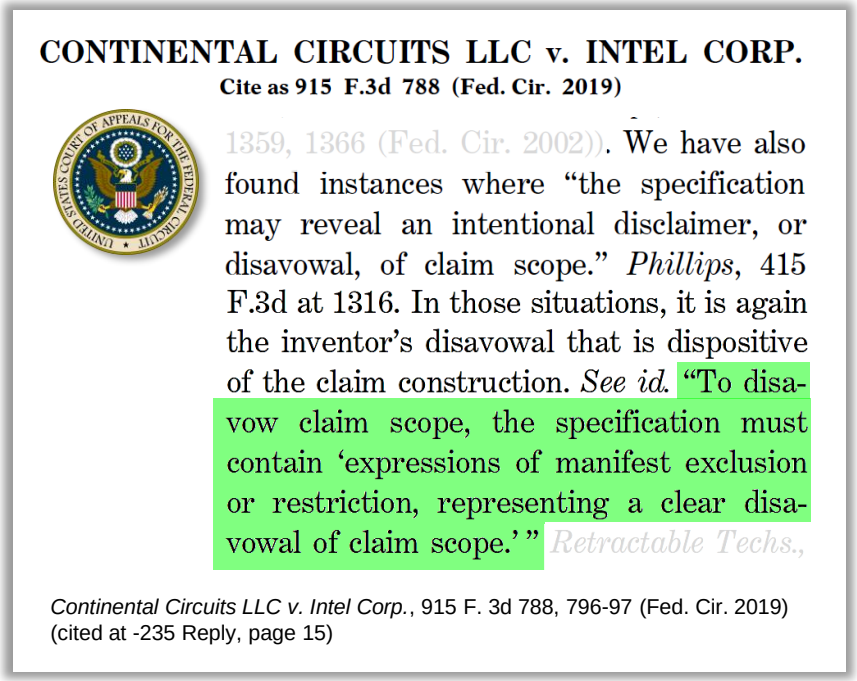
'932 patent, 12:25-27 (cited at -235 Reply, page 15)

> While the invention(s) has/have been described with respect to a limited number of embodiments, these should not be construed as limitations on the scope of the invention(s), but rather as examples of some of the embodiments. Those

'932 patent, 47:45-48 (cited at -235 Reply, page 15)

There is No Disclaimer of BAs Tuned to Multiple Frequencies

-235 Reply, page 15



CONTINENTAL CIRCUITS LLC v. INTEL CORP.
Cite as 915 F.3d 788 (Fed. Cir. 2019)

1359, 1366 (Fed. Cir. 2002)). We have also found instances where "the specification may reveal an intentional disclaimer, or disavowal, of claim scope." *Phillips*, 415 F.3d at 1316. In those situations, it is again the inventor's disavowal that is dispositive of the claim construction. *See id.* "To disavow claim scope, the specification must contain 'expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.'" *Retractable Techs.*,

Continental Circuits LLC v. Intel Corp., 915 F. 3d 788, 796-97 (Fed. Cir. 2019) (cited at -235 Reply, page 15)

Patent Owner's Construction of Booster Antenna

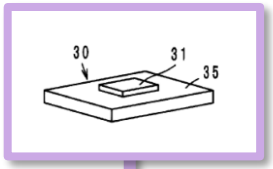
1. "Booster Antenna"

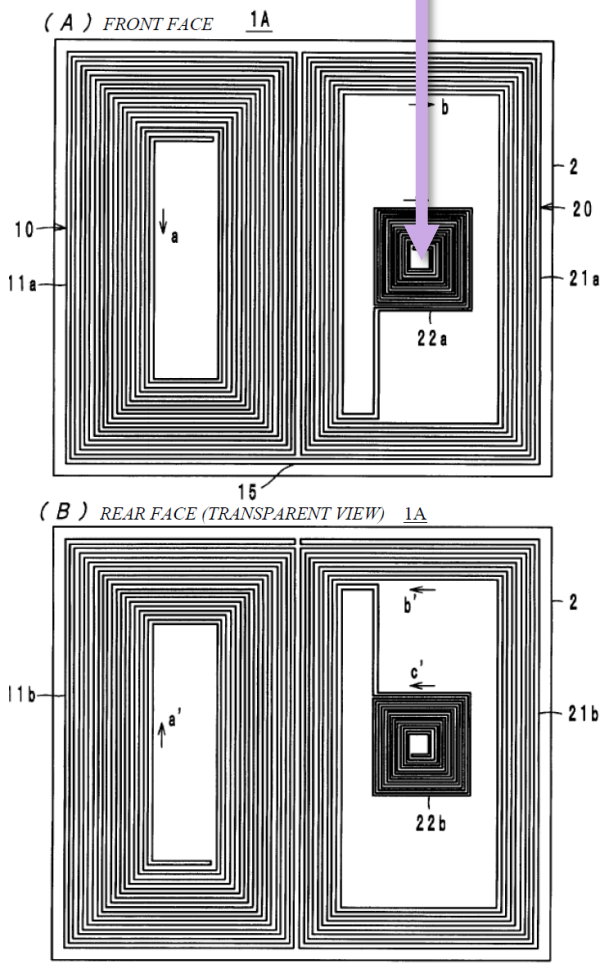
The term "booster antenna" appears in independent claim 1 and 5, as well as claim 2, 3, 4, 6, and 7. The parties' proposed constructions are as follows:

Patent Owner	Petitioner
"an antenna tuned to a single resonance frequency that enables a chip to communicate with an external reader"	"a conductive element that enables an IC chip to communicate with an eternal reader"

-235 POR, page 26

Murayama (-235 Ex. 1007), FIG. 2
(cited at -235 Petition, page 65; *see also* -235 Petition, pages 71-72)





Murayama (-235 Ex. 1007), FIG. 1
(cited at, *e.g.,* -235 Petition, pages 62-64)

Murayama's Compound Antenna is Tuned to Enable the Chip to Communicate with a Reader at One Frequency

66. Patent Owner's assertion that the Petition "mixed various components" of Murayama to "cobble[] together" a BA (POR, 64) is incorrect. My review confirmed that the Petition did not cobble anything together. Instead, it is Murayama who designed a single "compound antenna" using the various components identified in Murayama. The Petition merely identified Murayama's compound antenna as a booster antenna that operates at 13.56 MHz to communicate with an RFID reader—because that is precisely what it is. Petition, 65-66; Murayama, [0008].

67. Nevertheless, Patent Owner wrongly asserts that Murayama's booster antenna is "not tuned to a single resonant frequency." POR, 65. But, as the Petition explained, a booster antenna is a conductive element that enables an IC chip to communicate with an external reader. Petition, 16 (citing my previous declaration (Exhibit 1003), ¶¶ 76-77 and Ashizaki (Exhibit 1011), [0009]-[0010]). And Murayama only ever describes the full compound antenna (coils 21a/21/b, 22a/22b, and 11a/11b) as being tuned to enable the IC chip to communicate with a reader at the 13.56 MHz RFID frequency.

-235 van der Weide Reply Decl. (-235 Ex. 1055), ¶¶ 66-67
(cited at -235 Reply, pages 15-16)

Murayama's second antenna 20 is coupled to the IC chip via coupler parts 22a/22b (Murayama, [0024]-[0025]), and Murayama's first antenna 10 (which shares the same shape as second antenna 20) is "electrically connected" to second antenna 20 on one face. Murayama, [0026]. With Murayama's configuration, first antenna 10 "function[s] as a boost antenna when the second antenna 20 is operating" by increasing the second antenna's gain and range (Murayama, [0026]) and the overall compound antenna 1A is configured as a wireless communication device that communicates with the RFID reader-writer. Murayama, [0027].

-235 van der Weide Decl. (-235 Ex. 1003), ¶ 215 (cited at -235 Petition, page 66)

current flows in the first antenna 10 so as to form a magnetic field in the same direction as the second antenna 20. This increases the range over which the magnetic field is emitted, causing the first antenna 10 to function as a boost antenna when the second antenna 20 is operating. As a result, gain in the second frequency band is improved. Incidentally, forming the first antenna 10 and the second antenna 20 to have identical shapes as in the first example resulted in a communication range at 13.56 MHz that was at least 1.5 times greater than when the second antenna 20 was operated alone.

Murayama (-235 Ex. 1007), [0026] (cited at -235 Petition, pages 65-66, 74)

Murayama's Anti-Theft Functionality

-235 Reply, page 16

> Murayama discloses a wireless card that purportedly can operate in two distinct frequency bands, such that one card can work with different RFID systems (*i.e.*, different external card readers). Ex. 1007, ¶ 3. Murayama discloses a single

-235 POR, page 60

> 107. Murayama discloses a wireless card that it asserts can operate in two distinct frequency bands, such that one card can work with different RFID systems. Ex. 1007, ¶ 3. Murayama shows a single card with two distinct antennas 10, 20,

-235 Eisenstadt Decl., ¶ 107 (cited at -235 POR, page 61)

> An example of two different frequency bands used by an antenna is the 13.56 MHz band, which is used in RFID (Radio Frequency Identification) systems, and the 8.2 MHz band, which is used in anti-theft sensors (also known as anti-theft tags). Anti-theft tags are provided with antennas that are capable of using electromagnetic fields to communicate over comparatively long ranges. Antennas used in wireless communication devices for RFID use magnetic fields, and thus communicate over comparatively short ranges. While

Murayama (-235 Ex. 1007), [0003] (cited at -235 POR, page 60)

Murayama's Anti-Theft Functionality

> 68. Patent Owner also seizes upon the ability of coils 11a/11b in Murayama to resonate at 8.2 MHz—even though this does not describe a resonance frequency of the disclosed smart card booster antenna. At that frequency, Murayama's device functions as an anti-theft tag. Murayama's IC chip—coupled to the BA via coils 22a/22b—is not designed to communicate with an external reader at that frequency and is uninvolved during operation of Murayama's anti-theft tag. Murayama, [0008] ("In the aforementioned compound

-235 van der Weide Reply Decl. (-235 Ex. 1055), ¶ 68 (cited at -235 Reply, page 16)

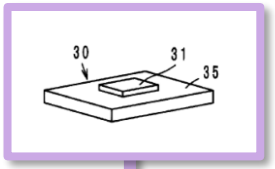
> In compound antenna 1A, the first antenna 10 forms a resonant circuit through the inductance of the first and second coiled electrodes 11a, 11b and the capacitance formed by the electrodes 11a, 11b being disposed opposing each other, and functions as an electromagnetic field antenna that resonates in a given first frequency band (for example, the 8.2 MHz band). Consequently, the first antenna resonates upon receiving radio waves in the first frequency band emitted by a transmitter of an anti-theft system. A receive of the

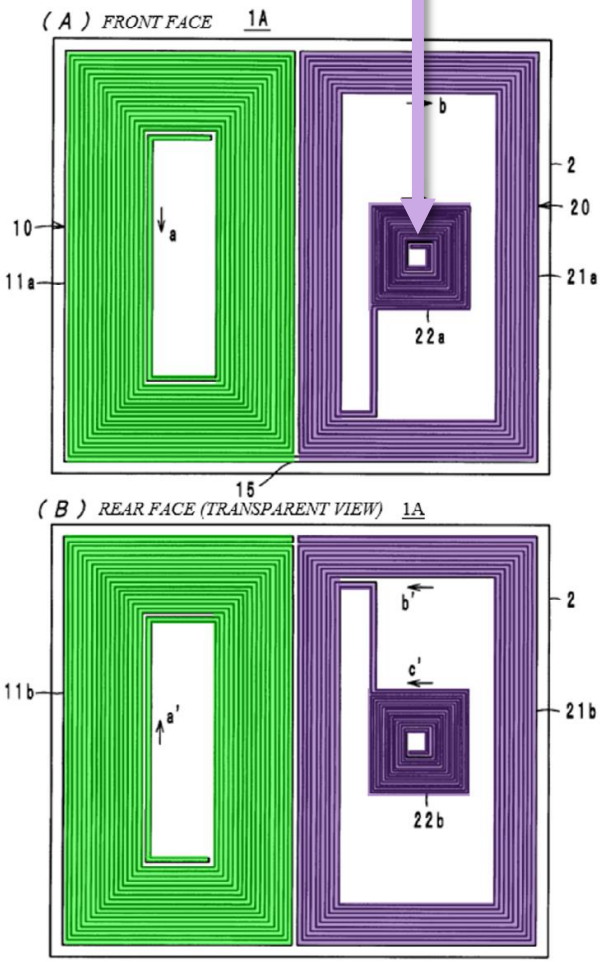
Murayama (-235 Ex. 1007), [0022] (cited at -235 Petition, page 74)

> As described above, the coupling of the wireless communication element 30 to the second antenna 20 results in the compound antenna 1A being configured as a wireless communication device (wireless IC tag) that communicates with a reader-writer of an RFID system. The wireless communication element 30 can be omitted to create an anti-theft tag that uses only the first antenna 10. In other words, the wireless communication

Murayama (-235 Ex. 1007), [0027] (cited at -235 Petition, pages 62, 64-66, 84)

Murayama (-235 Ex. 1007), FIG. 2 (cited at -235 Petition, page 65; *see also* -235 Petition, pages 71-72)





Murayama (-235 Ex. 1007), FIG. 1 (annotated) (from -235 Petition, page 63)

Patent Owner's Card Antenna Argument Relies On Patent Owner's "Single Resonance Frequency" Argument

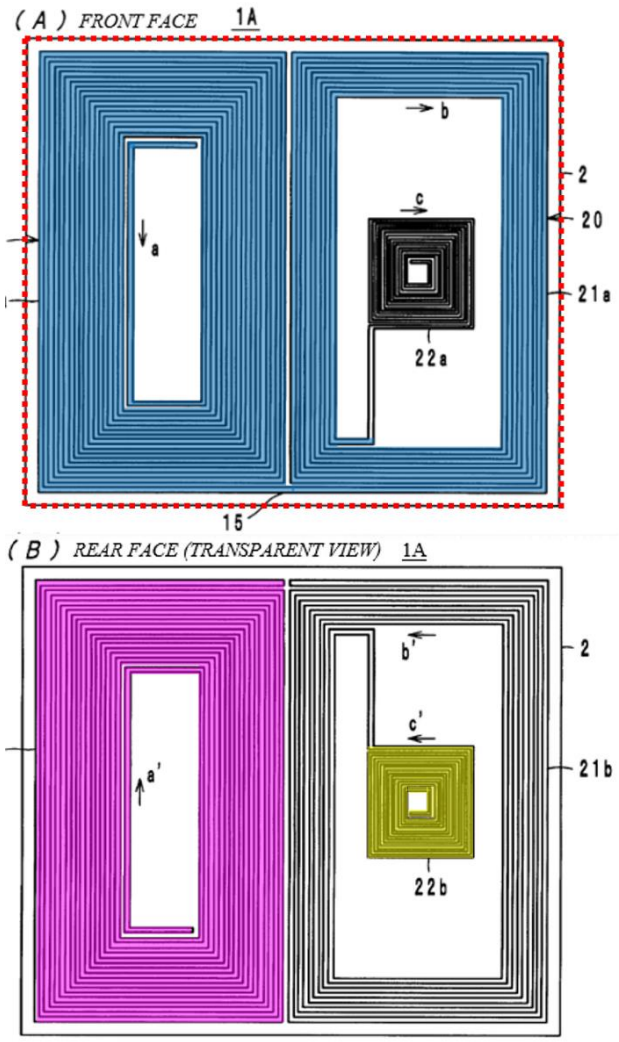
-235 POR, page 66

A card antenna component should be construed to mean "a component in a booster antenna for coupling with an external contactless reader." *See* § VI.B.2, *supra*. Further, a booster antenna should be construed as "an antenna tuned to a single resonance frequency that enables a chip to communicate with an external reader." *See* § VI.B.1, *supra*. Consequently, a card antenna component must be wholly in an antenna tuned to a single resonance frequency. Ex. 2003, ¶ 114.

However, Petitioner asserts that a combination of components in Murayama from multiple antennas tuned to multiple frequencies constitute a card antenna component. Petitioner alleges that Murayama's electrodes 11a and 21a (from the first antenna 10 and second antenna 20, respectively) constitute the card antenna component. Petition at 62. Because these components are not in an antenna tuned to a single frequency, the combination of Murayama's electrodes 11a and 21a cannot constitute a card antenna component. Ex. 2003, ¶ 114.

-235 POR, page 66

Murayama Has an Unconnected Extension Antenna



Murayama (-235 Ex. 1007), FIG. 1 (annotated)
(from -235 Petition, page 76)

[0022] In compound antenna 1A, the first antenna 10 forms a resonant circuit through the inductance of the first and second coiled electrodes 11a, 11b and the capacitance formed by the electrodes 11a, 11b being disposed opposing each other, and functions as an

Murayama (-235 Ex. 1007), [0022] (cited at -235 Petition, page 74)

[0025] Consequently, the first and second coiled electrodes 21a, 21b of the second antenna 20 receive radio waves in the second frequency band (for example, the UHF frequency band or the HF frequency band) emitted by a reader-writer of an RFID system, thereby causing the power supply circuit magnetically coupled to the first and second coupling parts 22a, 22b to resonate, and supplying only a received signal of a given frequency to the wireless IC chip 31. The wireless IC chip 31 extracts given energy from the received signal,

Murayama (-235 Ex. 1007), [0025] (cited at -235 Petition, pages 62, 64-66, 71-72)

[0026] When the second antenna 20 is operating, second-frequency-band current flows to the first antenna 10 due to the first antenna 10 being electrically connected to the second antenna 20 via the connecting part 15, and the magnetic fluxes in the loop axial directions of the antennas 10, 20 reinforce each other. However, the first antenna 10, which resonates in the first frequency band lower than the second frequency band, does not resonate from the second-frequency-band current, and acts as a distributed capacitive component; thus, current flows in the first antenna 10 so as to form a magnetic field in the same direction as the second antenna 20. This increases the range over which the magnetic field is emitted, causing the first antenna 10 to function as a boost antenna when the second antenna 20 is operating. As a result, gain in the second frequency band is improved. Incidentally, forming the first antenna 10 and the second antenna 20 to have identical shapes as in the first example resulted in a communication range at 13.56 MHz that was at least 1.5 times greater than when the second antenna 20 was operated alone.

Murayama (-235 Ex. 1007), [0026] (cited at -235 Petition, pages 65-66, 74)

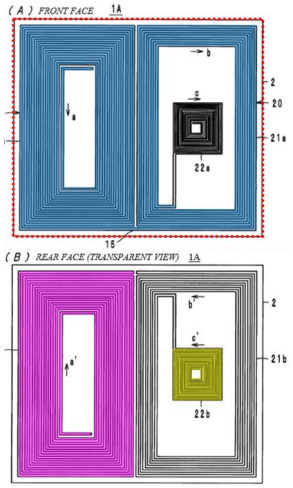
The Patent Says an Extension Antenna Can Be Unconnected

residual) area 148 of the surface of the card body CB. The antenna extension EA may comprise several turns (or traces) of wire (or other conductive material), and may be either (i) connected with one or both of the card antenna CA and coupler coil CC or (ii) not connected with either of the card antenna CA and coupler coil CC.

'932 patent, 10:62-67 (cited at -235 Petition, 4, 24, 73)

Murayama's Unconnected EA Contributes to the BA's Inductance

-235 Petition, pages 73-75;
-235 Reply, page 24



Murayama (-235 Ex. 1007), FIG. 1 (annotated) (from -235 Petition, page 76)

242. I understand (and a POSA would have understood) that Murayama's electrode 11b contributes to the inductance of booster antenna 1A. Murayama expressly states that "antenna 10 forms a resonant circuit *through the inductance of* the first and second coiled electrodes 11a, *11b* and the capacitance formed by the electrodes 11a, 11b being disposed opposing each other." Murayama, [0022]. Additionally, Murayama states that the electrodes 11a/11b, based on the number of turns of the coils, can have "increased… inductance value" to "increase communication range." Murayama, [0023]. The antennas 10 and 20 and their magnetic fluxes "reinforce each other," which "increases the range over which the magnetic field is emitted… [and antenna 10] function[s] as a boost antenna when the second antenna 20 is operating."). Murayama, [0026]. Murayama's electrode 11b thus contributes to the inductance of booster antenna 1A.

-235 van der Weide Decl. (-235 Ex. 1003), ¶ 242 (cited at -235 Petition, page 74)

96. The Petition pointed to Murayama's teachings that first antenna 10 "forms a resonant circuit through the inductance of the first and second coiled electrodes 11a, 11b and the capacitance" between them. Petition, 74; Murayama, [0022]-[0023]. A POSA would have understood that such a resonant circuit could not be formed only from coils with negligible inductance.

97. The Petition also cited Murayama's teaching that 11a/11b's inclusion "increases the range over which the magnetic field is emitted" and yields "communication range at 13.56 MHz that was at least 1.5 times greater" than 21a/21b alone. Petition, 74; Murayama, [0026]. As noted in my previous declaration, a POSA would have immediately understood based on this disclosure that electrode 11b contributes to the inductance of booster antenna 1A (Exhibit 1003, ¶ 211), because Murayama's compound antenna couples with an RFID reader through magnetic fields, and greater communication range using such magnetic fields could only arise from a non-negligible contribution to the inductance of Murayama's overall compound antenna that increased magnetic field strength. Murayama expressly teaches a greater magnetic field range with 11b present. Murayama, [0026]. Patent Owner raises no evidence suggesting otherwise, and Dr. Eisenstadt provided no opinion to support Patent Owner on this issue. Eisenstadt Dec., ¶ 111. *Cf.* '250 Eisenstadt Dec. (Exhibit 1051), ¶ 65 ("… *any* electrical component (or portion thereof) in a booster antenna contributes to the inductance of the booster antenna.").

-235 van der Weide Reply Decl. (-235 Ex. 1055), ¶¶ 96-97 (cited at -235 Reply, page 24)

Patent Owner's Arguments Against the "Disputed" Sentence

residual) area **148** of the surface of the card body CB. The antenna extension EA may comprise several turns (or traces) of wire (or other conductive material), and may be either (i) connected with one or both of the card antenna CA and coupler coil CC or (ii) not connected with either of the card antenna CA and coupler coil CC.

'932 patent, 10:62-67 (cited at -235 Petition, 4, 24, 73)

- **The "Disputed" Sentence Does Not Mean What It Says** -235 POR, pages 35-36
- **A Single Sentence Cannot Override a Definition** -235 POR, pages 34-35
- **Petitioner Gives No Weight to the Word "Extension"** -235 POR, pages 37-38
- **Priority Documents Show the Extension Antenna Connected to the Card Antenna and/or Coupler Coil** -235 POR, pages 12-22
- **There is No Disclosure of an Extension Antenna on "Opposite Sides of the Card Body"** -235 POR, pages 38-39
- **An Unconnected Extension Antenna is Not Enabled** -235 POR, page 38

Patent Owner's Argument That a Single Sentence Cannot Override a Definition Fails

> Petitioner bases its proposed construction on a single sentence, which states:

-235 POR, page 34

> To the extent that the sentence-in-question could be understood by a POSA to indicate that the extension antenna can be completely unconnected (and Patent Owner disagrees), this directly conflicts with the oceans of disclosure showing the extension must be connected. *See* § V.E.1, *supra*. These disclosures include

-235 POR, page 34

> *Trustees of Columbia Univ. in City of New York v. Symantec Corp.*, 811 F.3d 1359, 1366 (Fed. Cir. 2016) ("[A] single sentence in the specification cannot overcome the overwhelming evidence in other parts of the specification and the provisional application … demonstrating that the intended definition of [a] term ….") Ex. 2003,

-235 POR, page 35

The Patent Does Not "Define" Extension Antenna

-235 Reply, pages 20-22

The '932 patent defines the extension antenna as being an "extension" as described and depicted in both ancestral Appl. Nos. 61/697,825 (the '825 provisional application) and 13/600,140 (the '140 application):

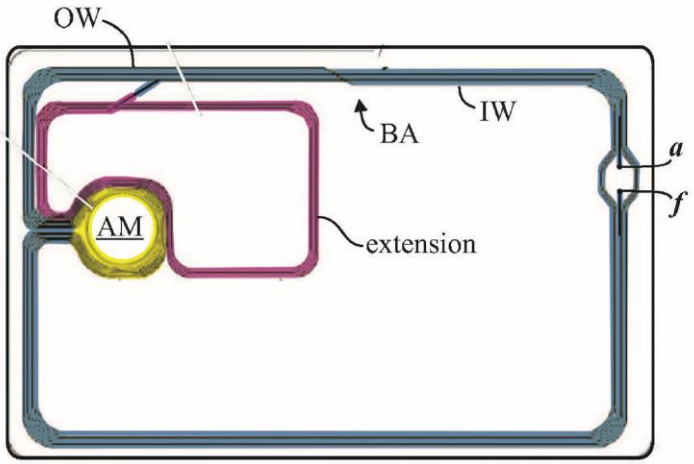
-235 POR, page 12

U.S. 61/697,825 filed 7 Sep. 2012 discloses (FIG. 5H therein) a booster antenna BA comprising an inner winding IW and an outer winding OW (as disclosed herein, together the inner winding IW and outer winding OW may constitute a card antenna CA), an "open loop" coupler coil CC at the position of the antenna module AM, and an "extension" which may be referred to herein as an "antenna extension" or "extension antenna" or "extension coil" EA. See also U.S. Ser. No. 13/600,140 filed 30 Aug. 2012 (now US 20130075477 published Mar. 28, 2013, incorporated by reference herein.

'932 patent, 16:12-23 (cited at -235 POR, page 12)

FIG. 5H shows a booster antenna BA similar to the one described with respect to FIG. 5D, wherein a portion of the booster antenna BA nearly fully encircles the antenna module in what may be referred to as a "coupling area". In **Fig 5D**, only the inner winding IW encircles the antenna module AM in the coupling area. In **FIG. 5H**, both of the outer winding OW and inner winding IW encircle the antenna module AM in the coupling area. The free ends (a, f) of the booster antenna BA are shown disposed at the right edge of the card body CB. An "extension" of the inner winding IW is shown, comprising some turns of wire in a spiral pattern disposed near the antenna module AM in the left hand side of the top (as viewed) portion of the card body CB. The extension is disposed outside of, but near the coupling area.

-235 Ex. 2007, page 33 (cited at -235 POR, pages 12-13)



Patent Owner's annotated FIG. 5H of '825 Provisional (-235 Ex. 2007)
(from -235 POR, page 13)

The Patent Does Not "Define" Extension Antenna

-235 Reply, pages 20-22

> Throughout the '932 patent, the extension antenna is described and depicted as a component that "extends from," is "connected," is "interconnected," is "contiguous" with, or is formed "continuously" with either the card antenna or the coupler coil. *See* '932 patent, FIG. 4A, FIG. 4B, FIG. 4C, FIG. 4D, FIG. 4E, FIG.

-235 POR, page 14

Disclosure	Permissive Language
4:62-65	"[A]n extension antenna (or extension coil; EA), which *may* be connected to and extend from at least one of the card antenna (CA) and the coupler coil (CC)"
5:54-59	"The extension antenna (EA) *may* be connected at one end to the booster antenna (BA). The extension antenna (EA) has two ends. One end *may* be connected to an end of the coupler coil (CC). One end *may* be connected to the card antenna (CA), or left unconnected as a free end."
15:52-58	"Each of the (CA, OW, IW, CC, EA) booster antenna components *typically* has two ends (see FIG. 3A), and *typically* has a plurality of windings (or turns). Both of the ends of a given antenna component *may be connected* to ends of other antenna components. Alternatively, one of the two ends of an antenna component *may be a free end*."

-235 van der Weide Reply Decl. (-235 Ex. 1055), ¶ 87 (cited at -235 Reply, pages 21-22)

Embodiment(s)	Permissive Language
FIGs. 4A, 4B, 4C, 4D, 4E, 4G, 4H	"These components [CA, CC, EA] *may* be formed (embedded in the card body CB) as one continuous embedded coil." '932 patent, 16:24-28, 17:3-6, 17:55-58, 18:10-13, 19:19-22, 20:21-24.
FIG. 4I	"The antenna *may* be laid on the card body CB as a continuous embedded coil." '932 patent, 20:35-38.
FIG. 11A, 11B, 11C, 11D, 11E, 11F	"The components CA, CC, EA of the booster antenna BA *may* be interconnected, as shown. The components of the booster antenna *may* comprise wire which is laid in a continuous path, from a starting point "a" to a finishing point "f" (or vice-versa)." '932 patent, 33:46-50.
FIGs. 12, 12A	"The booster antenna BA *may* comprise insulated wire, embedded in the card body CB. Each component *may* have a number of turns, *non-limiting examples of which are given*. The booster antenna BA *may* be laid (embedded), as follows. The number of turns, sense (clockwise, counter clockwise), and order of laying the turns and/or windings of the various booster antenna BA components—such as the inner winding IW and outer winding OW of the card antenna CA component, the inner portion IP and outer portion OP of the coupler coil CC component, and (optionally) the inner and outer windings of the extension antenna EA component)—*are exemplary, and may be changed, reversed, or done in a different order, and some of these elements or portions thereof may be omitted*." '932 patent, 36:53-66.
FIG. 13C, 13D, 13E	"FIGS. 13A-13E illustrate *an example* of laying the booster antenna (BA), step-by-step, or component (and portion thereof)—by—component. *For example*…" '932 patent, 37:65-67.
FIG. 13F	"FIG. 13F illustrates another embodiment of a booster antenna BA. Some comparisons may be made with the embodiments shown in FIGS. 4A-4E, 6D, 12, 12A, and 13A-13E, and this embodiment may incorporate various features and variations shown and described therein, or elsewhere, *although each and every feature and variation may not be shown in this figure*." '932 patent, 39:58-64.
FIG. 15B	"And, although the booster antenna BA in this example is shown without an[y] free ends, it should be understood that any of the components (CA, CC, EA, as well as CE) *may have at least one free end*." '932 patent, 47:2-5.

-235 van der Weide Reply Decl. (-235 Ex. 1055), ¶ 88 (cited at -235 Reply, pages 21-22)

The Patent Does Not "Define" Extension Antenna

-235 Reply, pages 20-22

The '932 patent defines the extension antenna as being an "extension" as described and depicted in both ancestral Appl. Nos. 61/697,825 (the '825 provisional application) and 13/600,140 (the '140 application):

-235 POR, page 12

U.S. 61/697,825 filed 7 Sep. 2012 discloses (FIG. 5H therein) a booster antenna BA comprising an inner winding IW and an outer winding OW (as disclosed herein, together the inner winding IW and outer winding OW may constitute a card antenna CA), an "open loop" coupler coil CC at the position of the antenna module AM, and an "extension" which may be referred to herein as an "antenna extension" or "extension antenna" or "extension coil" EA. See also U.S. Ser. No. 13/600,140 filed 30 Aug. 2012 (now US 20130075477 published Mar. 28, 2013, incorporated by reference herein.

'932 patent, 16:12-23 (cited at -235 POR, page 12)

Throughout the '932 patent, the extension antenna is described and depicted as a component that "extends from," is "connected," is "interconnected," is "contiguous" with, or is formed "continuously" with either the card antenna or the coupler coil. *See* '932 patent, FIG. 4A, FIG. 4B, FIG. 4C, FIG. 4D, FIG. 4E, FIG.

-235 POR, page 14

Q. So there's an application in this paragraph we've been discussing, the 825 application. Are you relying on this 825 application as providing examples of an extension antenna that inform your opinion as to what an extension antenna is, or are you saying that the examples in that 825 application are the definition of an extension antenna?

A. I'm using it for examples that inform. I'm not using it as my definition.

Eisenstadt Dep. (Ex. 1050), 154:21-155:5 (cited at -235 Reply, page 21)

Q. Does the patent anywhere lay out an express definition of extension antenna?

MR. McBRIDE: Objection. Form.

THE WITNESS: I do not recall. I'd have to look at the patent to say for sure, but I do not recall an explicit definition of extension antenna in writing. I see lots of definitions in figures and in the texts, pieces of the definition, which a POSA would have to put together to understand an extension antenna.

Eisenstadt Dep. (Ex. 1050), 155:14-22 (cited at -235 Reply, page 21)

Patent Owner's Argument That Petitioner Gives No Weight to the Word "Extension" Fails

-235 Reply, page 19

extension must be connected. *See* § V.E.1, *supra*. These disclosures include repeated express definitions (with quotation marks) of "extension," which is a synonym for extension antenna. *See, e.g.*, '932 patent, 16:18-20 ("'extension'

-235 POR, page 34-35

The '932 patent refers to an "extension antenna" with various synonyms, including "antenna extension," "extension antenna," "extension coil," "extension antenna component," "extension," or "EA". '932 patent, 6:23 ("extension antenna (EA) component"), 16:18-20 ("an 'extension' which may be referred to herein as an 'antenna extension' or 'extension antenna' or 'extension coil' EA"). Ex. 2003, ¶ 47.

-235 POR, page 11

U.S. 61/697,825 filed 7 Sep. 2012 discloses (FIG. 5H therein) a booster antenna BA comprising an inner winding IW and an outer winding OW (as disclosed herein, together the inner winding IW and outer winding OW may constitute a card antenna CA), an "open loop" coupler coil CC at the position of the antenna module AM, and an "extension" which may be referred to herein as an "antenna extension" or "extension antenna" or "extension coil" EA. See also U.S. Ser. No. 13/600,140 filed 30 Aug. 2012 (now US 20130075477 published Mar. 28, 2013, incorporated by reference herein.

'932 patent, 16:18-20 (cited at -235 POR, page 11-12, 35; -235 Reply, pages 19, 21)

residual) area **148** of the surface of the card body CB. The antenna extension EA may comprise several turns (or traces) of wire (or other conductive material), and may be either (i) connected with one or both of the card antenna CA and coupler coil CC or (ii) not connected with either of the card antenna CA and coupler coil CC.

'932 patent, 10:62-67 (cited at -235 Petition, 4, 24, 73; -235 Reply, 18, 23)

Patent Owner's Argument That Priority Documents Show the Extension Antenna Connected to the Card Antenna and/or Coupler Coil Fails

Not incorporated by reference.

-235 POR, pages i-ii

Include "disputed" sentence.

> Moreover, AmaTech identifies nothing in the ancestral applications ***requiring*** that an EA be connected to the CC or CA. VDW-Reply, ¶¶ 91-93.

-235 Reply, page 23

Patent Owner's Argument That There is No Disclosure of an Extension Antenna on "Opposite Sides of the Card Body" Fails

(d) There Is No Disclosure of an Extension Antenna on "Opposite Sides of the Card Body"

Petitioner justifies its overbroad view of "extension antenna component" based on the '932 patent at 22:49-62. Petition at 74. The cited section of the '932 patent refers to FIGS. 5F, 5G, and 5H, and describes an embodiment with two booster antennas (BA-1 and BA-2) as well as two coupler coils (CC-1 and CC-2). '932 patent, 22:49-62. This embodiment does not disclose an extension antenna at all, so it is irrelevant. Nor does the embodiment override the 100+ express

-235 POR, pages 38-39

Third, AmaTech conflates whether the BA can include components on separate card body surfaces with whether the EA must be ***connected*** to the CA or CC. POR, 38-39. AmaTech does not dispute that the specification contemplates BA components on opposite card body surfaces and does not ***require*** the EA to be on the same card body surface as any other BA component. Petition, 74. The

-235 Reply, page 19

Patent Owner's Argument Regarding Enablement Fails

REMBRANDT DATA TECHNOLOGIES, LP v. AOL, LLC
Cite as 641 F.3d 1331 (Fed. Cir. 2011)

We have stated that "[t]his court, however, repeatedly and consistently has recognized that courts may not redraft claims, whether to make them operable or to sustain their validity." *Chef Am., Inc.*

Rembrandt Data Techs. v. AOL, 641 F.3d 1331, 1339 (Fed. Cir. 2011)
(cited at -235 Reply, page 22)

HILL–ROM SERVICES, INC. v. STRYKER CORP.
Cite as 755 F.3d 1367 (Fed. Cir. 2014)

District Court Decision at *7. Enablement concerns do not justify departing from the plain and ordinary meaning of "datalink." Where the meaning of a claim term is clear, as it is here, we do not rewrite the claim to preserve its validity. *Liebel–*

Hill-Rom Servs. v. Stryker Corp., 755 F.3d 1367, 1374 (Fed. Cir. 2014)
(cited at -235 Reply, page 22)

Evidence That Murayama's EA Contributes Non-Negligibly to the Booster Antenna's Inductance

-235 Petition, pages 65-66, 74

[0022] In compound antenna 1A, the first antenna 10 forms a resonant circuit through the inductance of the first and second coiled electrodes 11a, 11b and the capacitance formed by the electrodes 11a, 11b being disposed opposing each other, and functions as an

Murayama (-235 Ex. 1007), [0022] (cited at -235 Petition, page 74)

[0026] When the second antenna 20 is operating, second-frequency-band current flows to the first antenna 10 due to the first antenna 10 being electrically connected to the second antenna 20 via the connecting part 15, and the magnetic fluxes in the loop axial directions of the antennas 10, 20 reinforce each other. However, the first antenna 10, which resonates in the first frequency band lower than the second frequency band, does not resonate from the second-frequency-band current, and acts as a distributed capacitive component; thus, current flows in the first antenna 10 so as to form a magnetic field in the same direction as the second antenna 20. This increases the range over which the magnetic field is emitted, causing the first antenna 10 to function as a boost antenna when the second antenna 20 is operating. As a result, gain in the second frequency band is improved. Incidentally, forming the first antenna 10 and the second antenna 20 to have identical shapes as in the first example resulted in a communication range at 13.56 MHz that was at least 1.5 times greater than when the second antenna 20 was operated alone.

Murayama (-235 Ex. 1007), [0026] (cited at -235 Petition, pages 65-66, 74)

Evidence That Murayama's EA Contributes Non-Negligibly to the Booster Antenna's Inductance

-235 Petition, page 74;
-235 Reply, page 24

242. I understand (and a POSA would have understood) that Murayama's electrode 11b contributes to the inductance of booster antenna 1A. Murayama expressly states that "antenna 10 forms a resonant circuit *through the inductance of* the first and second coiled electrodes 11a, *11b* and the capacitance formed by the electrodes 11a, 11b being disposed opposing each other." Murayama, [0022]. Additionally, Murayama states that the electrodes 11a/11b, based on the number of turns of the coils, can have "increased… inductance value" to "increase communication range." Murayama, [0023]. The antennas 10 and 20 and their magnetic fluxes "reinforce each other," which "increases the range over which the magnetic field is emitted… [and antenna 10] function[s] as a boost antenna when the second antenna 20 is operating."). Murayama, [0026]. Murayama's electrode 11b thus contributes to the inductance of booster antenna 1A.

-235 van der Weide Decl. (-235 Ex. 1003), ¶ 242 (cited at -235 Petition, page 74)

96. The Petition pointed to Murayama's teachings that first antenna 10 "forms a resonant circuit through the inductance of the first and second coiled electrodes 11a, 11b and the capacitance" between them. Petition, 74; Murayama, [0022]-[0023]. A POSA would have understood that such a resonant circuit could not be formed only from coils with negligible inductance.

97. The Petition also cited Murayama's teaching that 11a/11b's inclusion "increases the range over which the magnetic field is emitted" and yields "communication range at 13.56 MHz that was at least 1.5 times greater" than 21a/21b alone. Petition, 74; Murayama, [0026]. As noted in my previous declaration, a POSA would have immediately understood based on this disclosure that electrode 11b contributes to the inductance of booster antenna 1A (Exhibit 1003, ¶ 211), because Murayama's compound antenna couples with an RFID reader through magnetic fields, and greater communication range using such magnetic fields could only arise from a non-negligible contribution to the inductance of Murayama's overall compound antenna that increased magnetic field strength. Murayama expressly teaches a greater magnetic field range with 11b present. Murayama, [0026]. Patent Owner raises no evidence suggesting otherwise, and Dr. Eisenstadt provided no opinion to support Patent Owner on this issue. Eisenstadt Dec., ¶ 111. *Cf.* '250 Eisenstadt Dec. (Exhibit 1051), ¶ 65 ("… *any* electrical component (or portion thereof) in a booster antenna contributes to the inductance of the booster antenna.").

-235 van der Weide Reply Decl. (-235 Ex. 1055), ¶¶ 96-97 (cited at -235 Reply, page 24)

Patent Owner Disclaimed Claims 8-10 After Institution

Electronically filed on:

September 6, 2022

-235 Ex. 2004

Paper 13
Date: June 13, 2022

-235 Institution Decision (Paper 13)

STATUTORY DISCLAIMER FILED UNDER 37 CFR § 1.321(a)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

Pursuant to 37 CFR § 1.321(a), patent owner AmaTech Group Limited hereby disclaims claims 8-10 of U.S. Pat. 9,195,932. AmaTech Group Limited is the assignee of the entire right, title, and interest of U.S. Pat. 9,195,932. A statement under 37 CFR § 3.73(c) is of record in this application. Also submitted herewith is the fee under 37 CFR § 1.20(d). The Commissioner is authorized to charge any necessary fees or credit any overpayment to deposit account No. 13-0017.

-235 Ex. 2004

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

-235 Institution Decision (Paper 13)

Coupling Coefficient (K)

The coupling coefficient (K) is defined by:

$$k = \frac{M}{\sqrt{L_1 \cdot L_2}}$$

The coupling coefficient (K) introduces a qualitative prediction for the coupling of the antennas independently of their geometric dimensions. L**1** is the inductance of a first antenna and L**2** is the inductance of a second antenna.

Eray (Ex. 1009), 11:16-26 (cited at -235 Petition, page 3; -417 Petition, page 3)

Magnetic Field (H) and Mutual Inductance (M)

Let us consider these 3 rules, governing an HF RFID/NFC antenna system with a coil winding, known to the person skilled in the art:

The magnetic field (H) is defined by:

$$H = \frac{I \cdot N \cdot R^2}{2\sqrt{(R^2 + x^2)^3}}$$

for circular antennas. N is the number of turns of the antenna, R is the radius of the antenna, and x is the distance from the centre of the antenna in direction x normal to the antenna.

Eray (Ex. 1009), 10:55-67 (cited at -235 Petition, page 3; -417 Petition, page 3)

Mutual inductance (M) is defined by:

$$M_{21} = \frac{\mu_0 \cdot N_1 \cdot R_1^2 \cdot N_2 \cdot R_2^2 \cdot \pi}{2\sqrt{(R_2^2 + x^2)^3}}$$

in which N**1** is the number of turns of a first antenna and N**2** is the number of turns of a second antenna. Mutual inductance is a quantitative description of the flux coupling two conductor loops.

Eray (Ex. 1009), 11:1-12 (cited at -235 Petition, page 3; -417 Petition, page 3)

37 C.F.R. § 42.23(b) Oppositions, replies, and sur-replies

All arguments for the relief requested in a motion must be made in the motion. A reply may only respond to arguments raised in the corresponding opposition, patent owner preliminary response, patent owner response, or decision on institution. A sur-reply may only respond to arguments raised in the corresponding reply and may not be accompanied by new evidence other than deposition transcripts of the cross-examination of any reply witness.

37 C.F.R. § 42.23(b)

2. "Card Antenna Component"

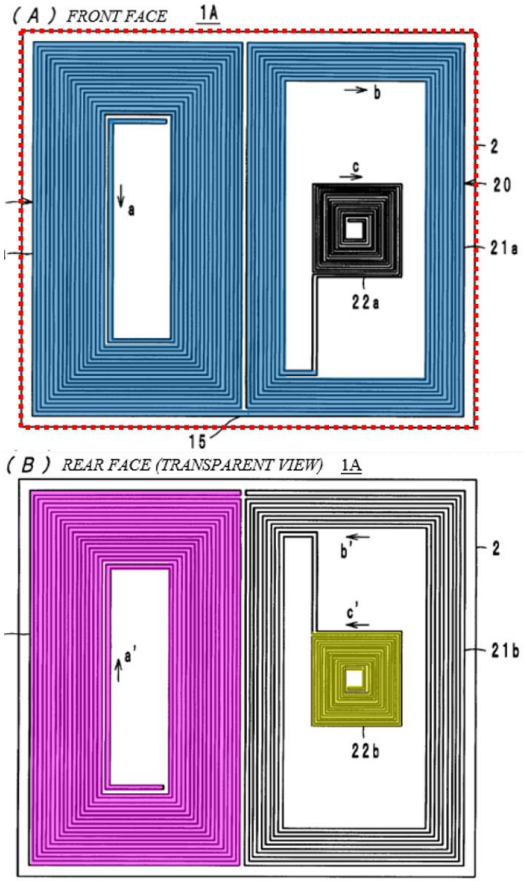
"Card antenna component" appears in independent claims 1 and 5, and in the body of claim 3. The parties' proposed constructions are as follows:

Patent Owner	Petitioner
"a component in a booster antenna for coupling with an external contactless reader"	"a relatively large winding for coupling with an external contactless reader."

-235 POR, page 28

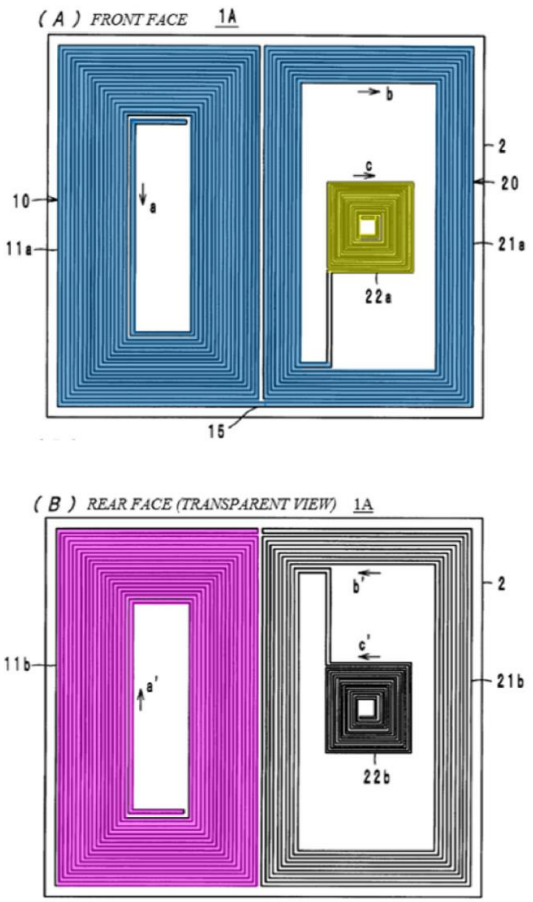
Petitioner's Mapping Versus Patent Owner's Version

PETITION FOR *INTER PARTES* REVIEW

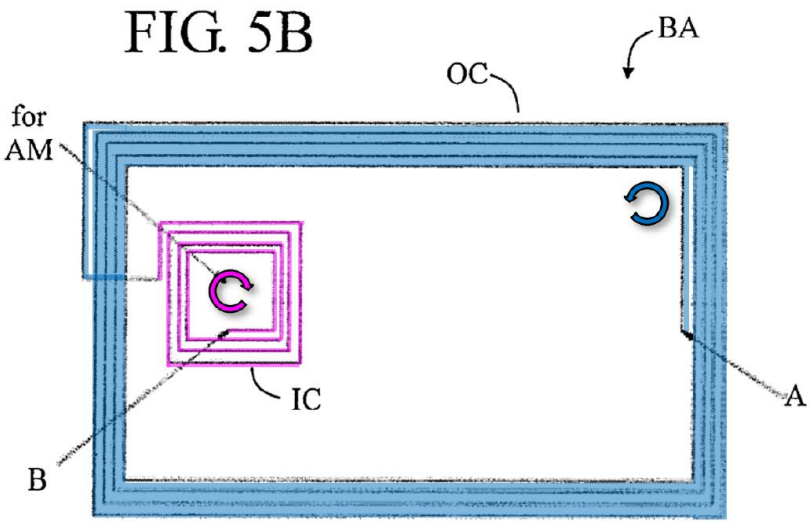


Murayama (-235 Ex. 1007), FIG. 1 (annotated)
(from -235 Petition, page 76)

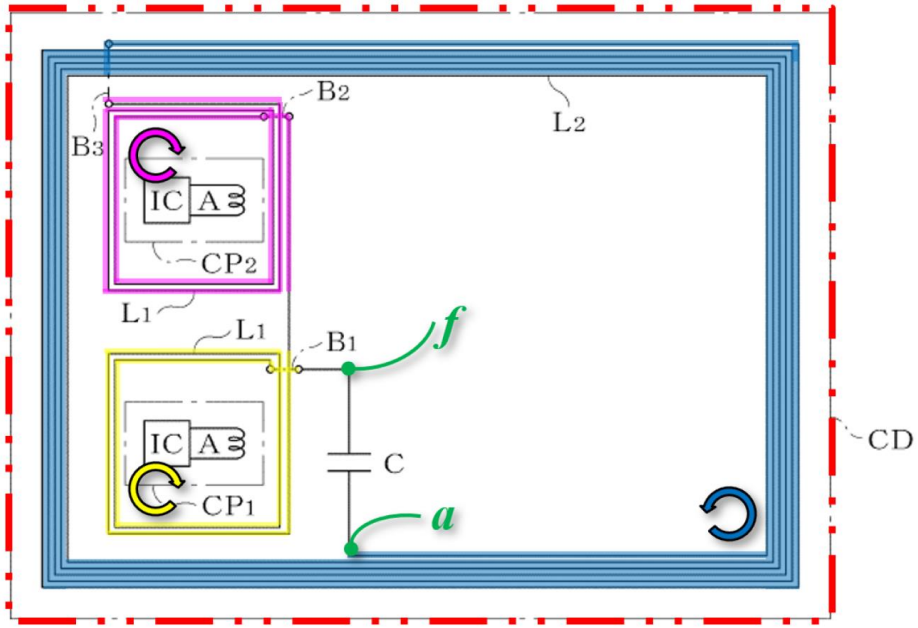
PATENT OWNER RESPONSE



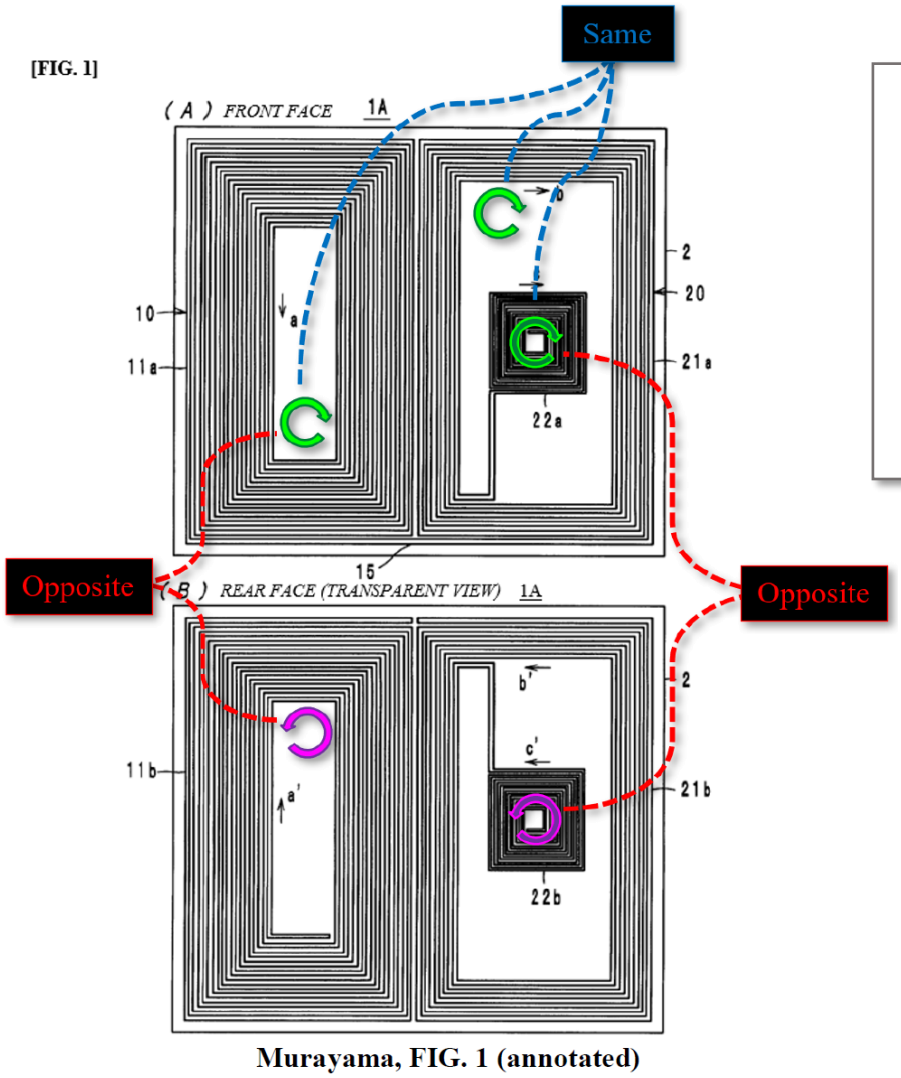
Patent Owner's annotated Figure from -235 POR, page 65



Annotated '932 patent, FIG. 5B (from -235 Petition, *e.g.,* page 34)



Annotated Takeda-322 FIG. 3 (from -235 Petition, *e.g.,* page 37)



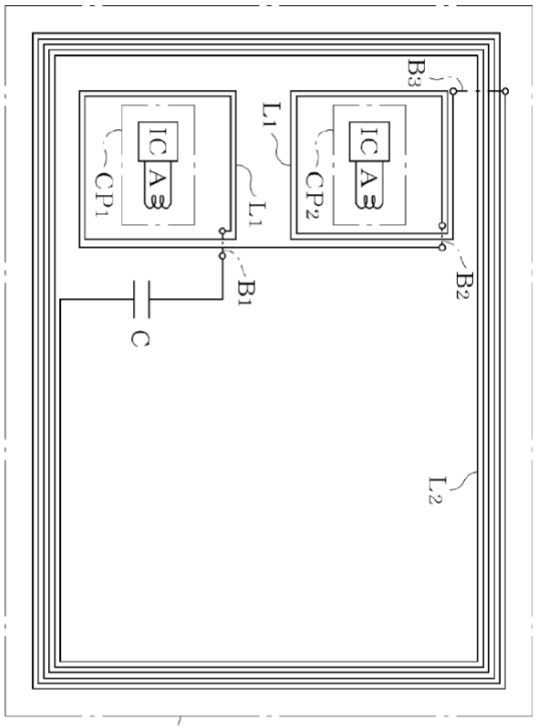
Murayama, FIG. 1 (annotated)

Electrodes 11a, 11b "are looped in coil patterns in ***opposite*** directions" indicated by arrows a, a' "from the center on the front and rear faces of the substrate 2." Murayama, [0014]. This results in the coil patterns for 11a, 11b being mirror images that align (like a human's left/right hands align when brought together) to capacitively couple and allow current to flow in the same direction. Murayama, [0014], VDW, ¶¶ 244-247. Thus, electrodes 11a, 11b have opposite "orientations" and opposite "sense." '932 patent, 12:38-52; VDW, ¶¶ 248.

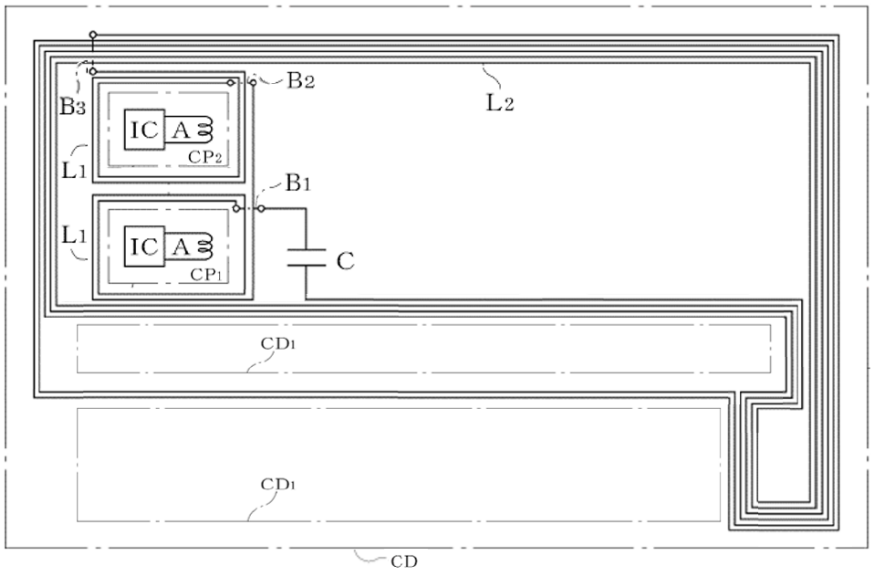
-235 Petition, pages 76-77

Annotated Murayama FIG. 1 (from -235 Petition, *e.g.,* page 80)

Implementations of Takeda-322 from -417 Petition



Obvious Portrait-Orientation



Obvious Embossed Implementation

Petitioner's Figures from -417 Petition, page 25

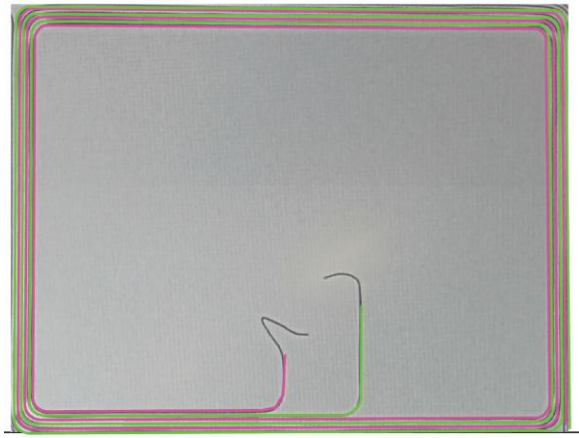
> As for the requirement of the extension antenna being disposed in available card space, it is apparent that any coil could only be located in available card space. Thus, this requirement is meaningless too. Ex. 2003, ¶ 80.

-235 POR, page 33

> With respect to characteristic #2 (the extension antenna is disposed in "available card body space"), it is apparent that virtually any component in a smart card could only be disposed in available card body space. Note, the "card body" or "CB" is the substrate/inlay in or on which the booster antenna is located. *See* '250 patent, 2:13-31. Ex. 2003, ¶ 61.

-417 POR, page 20

The **extension antenna** of the example CPI card, illustrated in magnified fashion below, includes an **outer winding** and an **inner winding**.



-235 Ex. 1018, page 214 ("magnified," annotated image from page 208, cited at -235 Petition, page 28)

The card body of the CPI card, illustrated below, includes an **extension antenna** disposed in the **third area**:

-417 Ex. 1018, page 195 (cited at -417 Petition, page 52)

US 9,195,932 B2

DISTINGUISHING OVER SOME OF THE PRIOR ART

It may be noted that the turns or tracks in the Infineon publication are not shown crossing over one another. Therefore, they do not form a "true" coil which would contribute to the inductance of the booster antenna. Compare U.S. Pat. No. 8,130,166 (Assa Abloy; 2012) which shows (FIGS. 3, 5, 6 therein) crossovers for all of their spirals (booster antenna components). In the present invention, the antenna extension EA is in the form of a "true" coil, involves at least one crossover, and contributes to the inductance of the booster antenna BA.

'932 patent, 27:35-44 (cited at -235 Petition, pages 4, 24, 27, 74; -235 POR, pages 17, 37; -235 Reply, pages 9-10, 12)

US 9,033,250 B2

Distinguishing Over Some of the Prior Art

It is of particular interest that the turns or tracks in the Infineon publication are not shown crossing over one another, in which case they would form a "true" coil and contribute to the inductance of the booster antenna. Compare U.S. Pat. No. 8,130,166 (Assa Abloy; 2012) which shows (FIGS. 3, 5, 6 therein) crossovers for all of their spirals (booster antenna components). In the present invention, the antenna extension EA is in the form of a "true" coil, involves at least one crossover, and contributes to the inductance of the booster antenna BA.

'250 patent, 23:61-24:3 (cited at -417 Petition, pages 4, 49-50, 52, 58, 80-81; -417 Reply, page 3, 11, 13-14)

FIG. 4A

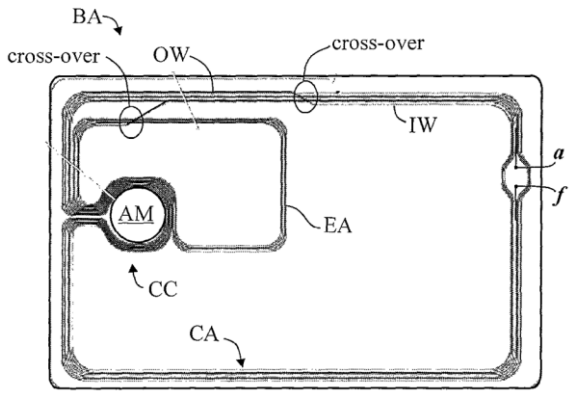


FIG. 4B

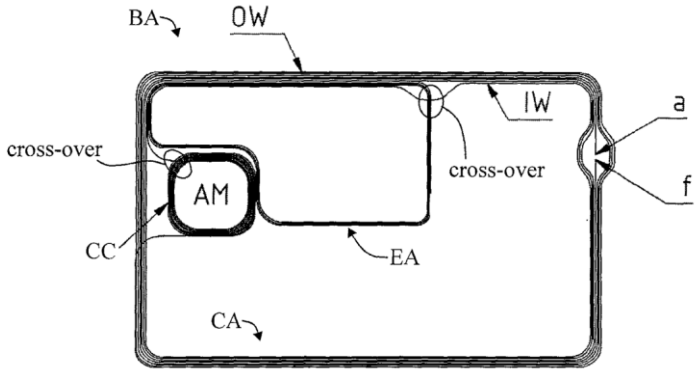


FIG. 4C

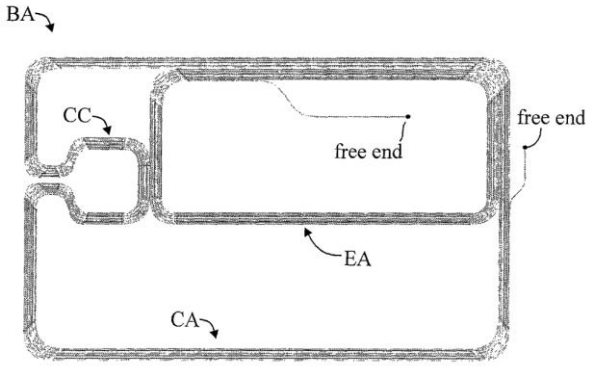


FIG. 4D

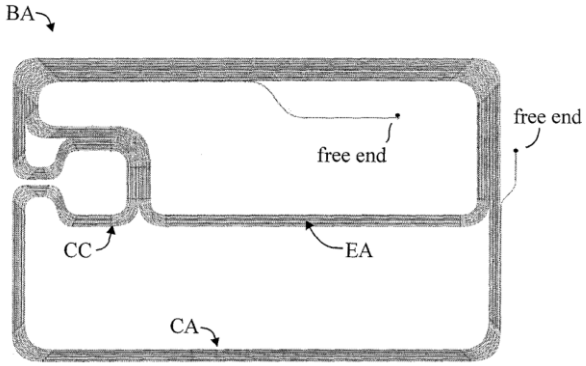
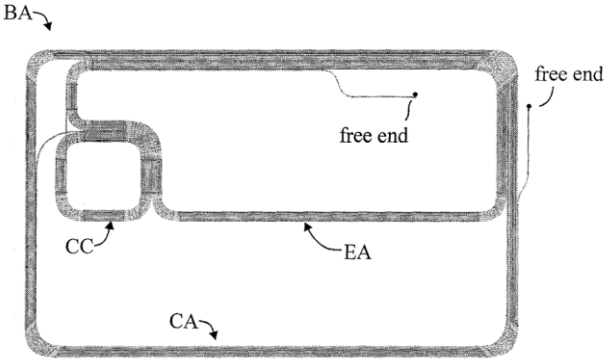


FIG. 4E

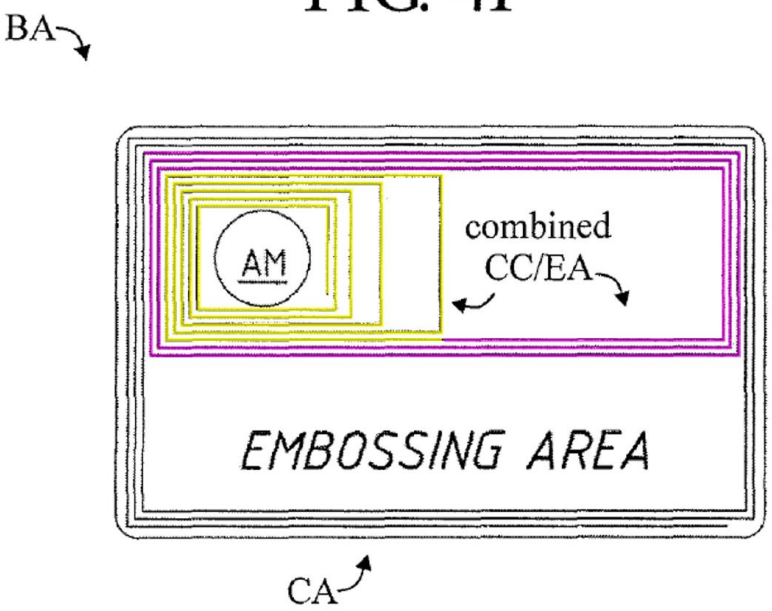


’932 patent, FIGs. 4A-4E (cited at -235 POR, pages 14, 18, 36, 43)
’250 patent, FIGs. 4A-4E (cited at -417 POR, page 27)

PO's Expert Acknowledged Border Was Arbitrary

-235 Reply, pages 5-7;
-417 Reply, pages 6-9

FIG. 4F



Patent Owner's annotated FIG. 4F (from -235 POR, page 41; -417 POR, page 24)

> Q. So there's some amount of subjectivity in terms of where you choose to color yellow versus pink?
>
> MCBRIDE: Object to the characterization.
>
> THE WITNESS: There's not that much subjectivity. There's kind of a transition there that after the fourth winding of the AM to the last -- fourth winding of the C sub C to the fifth winding of the C sub C, you could make a transition there or you could make it a little further. But there's, like, a small area, a half an inch, where you could move that back or forth, but not too much.

Eisenstadt Dep. (Ex. 1050), 143:10-20 (cited at -235 Reply, pages 5-6; -417 Reply, page 7)

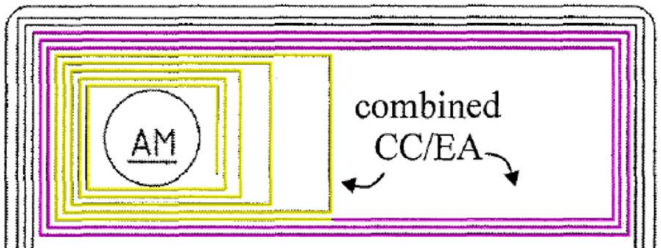
> Q. So, again, there's some amount of subjectivity in terms of how you might shade that portion of that vertical line?
>
> MR. MCBRIDE: Objection to the characterization. form.
>
> THE WITNESS: Yeah. And I would have to go through a full analysis to -- but I had to do something here, so I did something.

Eisenstadt Dep. (Ex. 1050), 146:19-147:2 (cited at -235 Reply, pages 5-6; -417 Reply, page 7)

PO's Expert Acknowledged Border Was Arbitrary

A. I would say that the structural distinction is that the C sub C turns are all in very, very close proximity or pretty close proximity to the AM so that they capture the inductive energy of the AM. That's their sole purpose.

Eisenstadt Dep. (Ex. 1050), 142:1-5 (cited at -235 Reply, page 6; -417 Reply, page 8)



Excerpt of Patent Owner's annotated FIG. 4F (from -235 POR, page 41; -417 POR, page 24)

Q. Looking at the vertical yellow that's just to the left of the combined CC/EA --

A. Uh-huh.

Q. -- you've colored that yellow. Is it your view that that vertical length of vertical wire inductively couples the booster antenna with the module antenna?

Eisenstadt Dep. (Ex. 1050), 144:18-24 (cited at -235 Reply, page 6; -417 Reply, page 7)

THE WITNESS: You're talking the one right just left of the C sub C arrow?

MR. CORBETT: Yes.

THE WITNESS: See, I -- I view that as a fairly ineffective coil for inductively coupling. And that's one of the reasons why you would separate these two, is because the ones that are big, big loopy coils or the red ones are going to have a lot more inductance than that little coil over there. So that is a relatively bad E sub A coil, if one was to call it an EA coil. It's a bad EA coil.

Eisenstadt Dep. (Ex. 1050), 145:2-12 (cited at -235 Reply, page 6; -417 Reply, page 7)

And that one line, it could be coupled still to the AM and not be really helping the booster, or it could be weakly coupled to the AM and be helping the booster. I cannot determine that.

BY MR. CORBETT:

Q. It could be doing either?

A. It could be doing either.

Eisenstadt Dep. (Ex. 1050), 146:10-16 (cited at -235 Reply, page 6; -417 Reply, page 7)

PO's Expert's Discussion of Roman Numeral One

A. Yeah, the extension antenna needs to be connected to either the coupler coil or the card antenna or both.

Eisenstadt Dep. (Ex. 1050), 156:6-8 (cited at -235 Reply, page 19)

Q. Starting at the bottom at line 63, there's a sentence that says the extent -- "The antenna extension, EA, may comprise several turns or traces of wire or other conductive material and may either: i., connected with one or both of the card antenna, CA, and coupler coil; or ii, not connected with either the card antenna, CA, and coupler coil, CC." Do you see that?

A. Yes, I do.

Q. So I want to talk about the three scenarios we just talked about. Scenario one we talked about was the extension antenna connected with the card antenna but not the coupler coil; right?

A. Right.

Q. You would agree that that falls under little romanette i; correct?

A. Yeah. I actually have an opinion here. Okay. So I would agree that if you have a -- either connected -- it's connected with the card antenna, it would be covered by i.

Q. Okay. And if you have the extension antenna connected to the coupler coil, that's covered by little romanette i; correct?

A. Yes.

Q. And if you have the extension antenna connected to both the card antenna and coupler coil, that's covered by little romanette i; right?

A. Correct.

Eisenstadt Dep. (Ex. 1050), 157:9-158:11 (cited at -235 Reply, page 19)

A Compound Booster Antenna (BA)

FIGS. **5**F,G,H illustrate forming two booster antennas, each having a partial coupler coil, in two different planes, such as one booster antenna on each of two opposite sides of the card body (substrate), or on two separate layers which may then be laminated together.

FIG. **5**I shows that a first booster antenna BA-1 may be formed on one side of the card body CB with its coupler coil component CC-1 encircling the top half (approximately 180°) of the antenna module AM. FIG. **5**J shows that a second booster antenna BA-2 may be formed on the opposite side of the card body CB with its coupler coil component CC-2 encircling the bottom half (approximately 180°) of the antenna module AM.

'932 patent, 22:49-62 (cited at -235 Petition, pages 5, 66, 68, 71, 74)
(describing FIGS. 5F, 5G,and 5H at right)

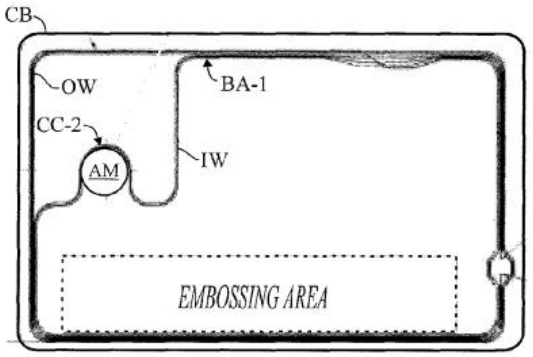


FIG. 5F

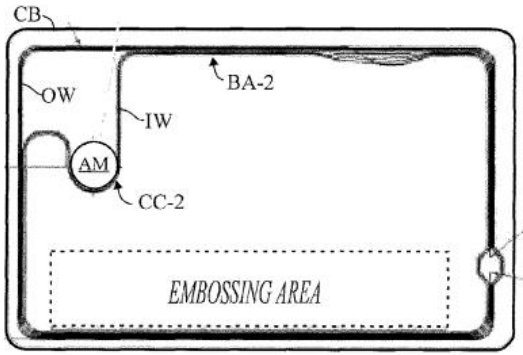
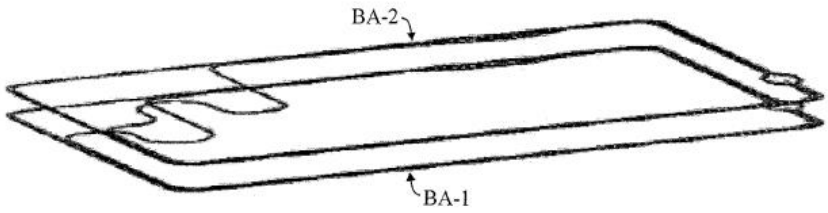


FIG. 5G

FIG. 5H



[0014] The first antenna 10 is constituted by first and second coiled electrodes 11a, 11b formed opposing each other on a first main face (front) and a second main face (rear) of the insulating substrate 2. The first and second coiled electrodes 11a, 11b are looped in coil patterns in opposite directions (the direction indicated by arrow a in the case of the first coiled electrode 11a on the front, and in the direction indicated by arrow a' in the case of the second coiled electrode 11b on the rear) from the center on the front and rear faces of the substrate 2, and are capacitively coupled across the insulating substrate 2. As a result, current flows through the first and second coiled electrodes 11a, 11b in the same direction, making it possible to increase the strength of magnetic fields (synthetic magnetic fields) generated by the first and second coiled electrodes 11a, 11b.

Murayama (-235 Ex. 1007), [0014] (cited at -235 Petition, page 62-64, 74, 76-79, 83, 86)

[0015] The second antenna 20 is constituted by first and second coiled electrodes 21a, 21b formed opposing each other on the front and rear faces of the insulating substrate 2, and comprises first and second coupling parts 22a, 22b that are looped in spiral patterns in the center. The first and second coiled electrodes 21a, 21b are looped in coil patterns extending in opposite directions (the direction indicated by arrow b in the case of the first coiled electrode 21a on the front, and in the direction indicated by arrow b' in the case of the second coiled electrode 21b on the rear) from the center on the front and rear faces of the substrate 2, and are capacitively coupled across the insulating substrate 2. The first and second coupling parts 22a, 22b are also looped in opposite directions (see arrows c, c'), and are capacitively coupled across the insulating substrate 2. As a result, current flows through the first and second coiled electrodes 21a, 21b in the same direction, making it possible to increase the strength of magnetic fields (synthetic magnetic fields) generated by the first and second coiled electrodes 21a, 21b, as in the case of the first antenna 10.

Murayama (-235 Ex. 1007), [0015] (cited at -235 Petition, page 64, 70, 72, 78, 81, 83, 86)

[0016] The first antenna 10 and the second antenna 20 are electrically connected on the front face of the substrate 2. This connecting part 15 is a single peripheral location at which the first coiled electrode 11a of the first antenna 10 and the first coiled electrode 21a of the second antenna 20 are adjacent. The first antenna 10 and the second antenna 20 are not (DC) electrically connected on the rear face of the substrate.

Murayama (-235 Ex. 1007), [0016] (cited at -235 Petition, page 64, 68, 72, 74)

[0024] Meanwhile, the second antenna 20 forms a resonant circuit through the inductance of the first and second coiled electrodes 21a, 21b and the capacitance formed by the electrodes 21a, 21b being disposed opposing each other, and resonates in a second frequency band (for example, the 13.56 MHz band) that is higher than the first frequency band, thereby functioning as a magnetic field antenna. The first and second coupling parts 22a, 22b are magnetically coupled to the power supply circuit board 35 forming part of the wireless communication element 30.

Murayama (-235 Ex. 1007), [0024] (cited at -235 Petition, pages 66, 71-72)

[0025] Consequently, the first and second coiled electrodes 21a, 21b of the second antenna 20 receive radio waves in the second frequency band (for example, the UHF frequency band or the HF frequency band) emitted by a reader-writer of an RFID system, thereby causing the power supply circuit magnetically coupled to the first and second coupling parts 22a, 22b to resonate, and supplying only a received signal of a given frequency to the wireless IC chip 31. The wireless IC chip 31 extracts given energy from the received signal, uses the energy as a power source to read out the information stored in memory, and matches to the given frequency in the power supply circuit, followed by emitting the information from the first and second coiled electrodes 21a, 21b via the first and second coupling parts 22a, 22b as a transmitted signal that is transmitted to the reader-writer.

Murayama (-235 Ex. 1007), [0025] (cited at -235 Petition, pages 62, 64-66, 71-72)

Authority Cited in Motion to Strike Briefs

§ 42.23 Oppositions, replies, and sur-replies.

All arguments for the relief requested in a motion must be made in the motion. A reply may only respond to arguments raised in the corresponding opposition, patent owner preliminary response, patent owner response, or decision on institution. A sur-reply may only respond to arguments raised in the corresponding reply and may not be accompanied by new evidence other than deposition transcripts of the cross-examination of any reply witness.

37 C.F.R. § 42.23(b) (cited at -235 Motion to Strike (Paper 32), pages 1, 3; -417 Motion to Strike (Paper 32), pages 1, 3)

Sur-replies to principal briefs (i.e., to a reply to a patent owner response or to a reply to an opposition to a motion to amend) normally will be authorized by the scheduling order entered at institution. The sur-reply may not be accompanied by new evidence other than deposition transcripts of the cross-examination of any reply witness. Sur-replies should only respond to

Consolidated Trial Practice Guide, page 73 (cited at -235 Motion to Strike (Paper 32), pages 1, 5; -417 Motion to Strike (Paper 32), pages 1, 5)

§ 42.5 Conduct of the proceeding.

The Board may waive or suspend a requirement of parts 1, 41, and 42 and may place conditions on the waiver or suspension.

37 C.F.R. § 42.5(b) (cited at -235 Motion to Strike (Paper 32), page 3; -417 Motion to Strike (Paper 32), page 3)

§ 42.51 Discovery.

The parties may agree to additional discovery between themselves. Where the parties fail to agree, a party may move for additional discovery. The moving party must show that such additional discovery is in the interests of justice, except in post-grant reviews where additional discovery is limited to evidence directly related to factual assertions advanced by either party in the proceeding (see § 42.224). The Board may specify conditions for such additional discovery.

37 C.F.R. § 42.51(b) (cited at -235 Opposition to Motion to Strike (Paper 34), page 4; -417 Motion to Strike (Paper 34), page 4)