

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

BMW OF NORTH AMERICA, LLC,

Petitioner,

v.

SCRAMOGE TECHNOLOGY LTD.,

Patent Owner.

Case No. IPR2023-01048
U.S. Patent No. 10,546,685

DECLARATION OF AL-THADDEUS AVESTRUZ, PhD

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c.	[1b] “second transmitting coil;”	35
d.	[1c] “a third transmitting coil on the first transmitting coil and the second transmitting coil;”	36
e.	[1d] “and a substrate to accommodate the first transmitting coil, the second transmitting coil, and the third transmitting coil, wherein the substrate comprises:”	37
f.	[1e] “a wall to surround a part of an outer circumference of the first transmitting coil and a part of an outer circumference of the second transmitting coil;”	38
g.	[1f] “a first protrusion inside an inner circumference of the first transmitting coil;”	39
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c.	[7b] “a second transmitting coil;”	60
d.	[7c] “a third transmitting coil on the first transmitting coil and the second transmitting coil;”	60
e.	[7d] “and a substrate to accommodate the first transmitting coil, the second transmitting coil, and	

	the third transmitting coil, wherein the substrate comprises:”	60
f.	[7e] “a first protrusion inside an inner circumference of the first transmitting coil;”	60
g.	[7f] “and a second protrusion inside an inner circumference of the second transmitting coil,”	60
h.	[7g] “wherein the third transmitting coil is disposed between the first protrusion and the second protrusion,”	60
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a.	[13Preamble] “A wireless power transmitting apparatus, comprising:”	62
b.	[13a] “a first transmitting coil;”	62
c.	[13b] “a second transmitting coil;”	63
d.	[13c] “a third transmitting coil on the first transmitting coil and the second transmitting coil;”	63
e.	[13d] “and a substrate to accommodate the first transmitting coil, the second transmitting coil, and the third transmitting coil, wherein the substrate comprises:”	63
f.	[13e] “a first protrusion inside an inner circumference of the first transmitting coil;”	63
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I. INTRODUCTION

1. I have been retained by BMW of North America, LLC (“Petitioner”) as an independent expert consultant in this proceeding before the Patent Trial and Appeal Board at the United States Patent and Trademark Office.

2. I am over 21 years of age and, if I am called upon to do so, I would be competent to testify as to the matters set forth herein.

3. I understand that this proceeding involves U.S. Patent No. 10,546,685 (“the ’685 patent,” Ex. 1001). The application for the ’685 patent was filed on May 7, 2019. It is a continuation of U.S. application Ser. No. 15/835,009, filed on December 7, 2017, which is a continuation of U.S. application Ser. No. 14/677,164, filed on April 2, 2015, which claims priority under 35 U.S.C. § 119(a) to Korean Patent Application No. 10-2014-0040009, filed on April 3, 2014. Ex. 1001, cover.

4. I have been asked by Petitioner to provide my opinion on whether the claims of the ’685 patent would have been obvious to a person of ordinary skill in the art at the time of the earliest claimed priority date of the ’685 patent. In performing my analysis, I have been asked to assume that the priority date is April 3, 2014. My opinions are set forth below.

5. Throughout this declaration, I refer to specific pages, figures, and/or line numbers of various exhibits. These citations are illustrative and are not

intended to suggest that they are the only support for the propositions for which they are cited.

II. SUMMARY OF OPINIONS

6. This declaration considers claims 1-18 of the '685 patent. Below, I set forth the opinions I have formed, the conclusions I have reached, and the bases for these opinions and conclusions. I believe the statements contained in this declaration to be true and correct to the best of my knowledge.

7. Based on my experience and knowledge of the art at the time of the applicable priority date, it is my opinion that claims 1-18 of the '685 patent would have been obvious based on the asserted grounds discussed below.

8. I am being compensated for my time at my normal hourly rate. My compensation is in no way contingent upon the nature of my findings, the presentation of my findings in testimony, or the outcome of this proceeding.

III. QUALIFICATIONS AND BACKGROUND

9. I believe that I am well qualified to serve as a technical expert in this matter based upon my qualifications, discussed in detail below. A copy of my curriculum vitae is included as Exhibit 1004.

10. I am competent to write this declaration.

11. In formulating my opinions, I have relied upon my training, knowledge, and experience in the relevant art. A copy of my current curriculum

vitae is provided as Exhibit 1004, and it provides a comprehensive description of my academic and employment history.

12. I have been a faculty member at the University of Michigan in the Electrical Engineering and Computer Science Department since 2016, performing research in wireless power transfer, power electronics, and circuits for consumer, medical, and automotive applications. I also teach undergraduate and graduate courses in power electronics, and an undergraduate class in circuits. In power electronics courses, I teach the design, building, and testing of printed circuit boards.

13. I received my PhD in 2016 from the Massachusetts Institute of Technology where I performed research on wireless power transfer. The title of my PhD thesis: Energy Management in Biomedical Applications: Wireless Power and Biosensing. This included the design, construction, and testing of wireless power transfer systems. At the Massachusetts Institute of Technology (“MIT”), I supervised seven masters students in research projects that included the design, building, and testing of power electronics, circuits, and printed circuit boards.

14. Prior to graduate school, I worked in industry for nine years designing and building power electronics, circuits, power electronics systems, and printed circuit boards. I have taken products from initial conception, requirements

definition, design, building, and testing, all the way through manufacturing, regulatory agency approvals, and documentation.

15. At the University of Michigan, I supervised and graduated five PhD students in research projects that included the design, building, and testing of power electronics, circuits, and printed circuit boards. Three of these PhD students performed research in wireless power transfer; one of these students is currently a postdoctoral researcher at MIT and will be a faculty member at the University of Maryland.

16. I have twelve issued U.S. patents. Three of these patents are directly related to wireless power transfer and one is used in wireless power transfer. Additionally, I have seven U.S. and one PCT patents pending. Four of these patents pending are directly related to wireless power transfer.

17. I am an author of twenty-eight journal papers and fifty-three conference papers. Eight of the journal papers are directly related to wireless power transfer. Nineteen of the conference papers are directly related to wireless power transfer.

18. I was a technical program co-chair of the 2021 IEEE Wireless Power Week responsible for the technical organization of the conference and selection of the papers.

19. I am a senior member of the IEEE Power Electronics Society. I am the immediate past elected chair of IEEE TC1: Technical Committee for the Control and Modeling of Power Electronics. I am the General Chair of the IEEE Twenty-Fourth IEEE Workshop on Control and Modeling for Power Electronics to be held at the University of Michigan.

20. I am an associate editor of the IEEE Open Journal of Power Electronics and have been a guest associate editor for the IEEE Journal of Emerging and Selected Topics in Power Electronics.

IV. MATERIALS CONSIDERED

21. In forming my opinions, I have reviewed the following documents, and any other document cited in this declaration.

Exhibit	Description
Ex. 1001	U.S. Patent No. 10,546,685 (“the ’685 patent”)
Ex. 1002	File History of U.S. Patent No. 10,546,685
Ex. 1005	U.S. Patent Application Publication No. 2013/0069586 to Jung et al. (“Jung”)
Ex. 1006	U.S. Patent Application Publication No. 2010/0007215 to Sakuma (“Sakuma”)
Ex. 1007	U.S. Patent No. 10,186,912 to Stamenic et al. (“Stamenic”)
Ex. 1008	U.S. Patent Application Publication No. 2012/0154086 to Willemsen et al. (“Willemsen”)
Ex. 1009	U.S. Patent Application Publication No. 2013/0015719 to Jung et al. (“Jung 719”)

Exhibit	Description
Ex. 1014	U.S. Patent Application Publication No. 2012/0161535 to Jung et al. (“Jung 535”)
Ex. 1015	U.S. Patent Application Publication No. 2013/0181668 to Tabata et al. (“Tabata”)
Ex. 1016	U.S. Patent Application Publication No. 2013/0300204 to Partovi (“Partovi”)
Ex. 1017	U.S. Patent Application Publication No. 2011/0050382 to Baarman et al. (“Baarman”)
Ex. 1018	U.S. Patent Application Publication No. 2012/0313742 to Kurs et al. (“Kurs”)
Ex. 1019	U.S. Patent Application Publication No. 2013/0249302 to An et al. (“An”)

22. I have also relied on my education, experience, research, training, and knowledge in the relevant art, and my understanding of any applicable legal principles described in this declaration.

23. All of the opinions contained in this declaration are based on the documents I reviewed and my knowledge and professional judgment. My opinions have also been guided by my understanding of how a person of ordinary skill in the art would have understood the claims of the '685 patent at the time of the earliest claimed priority date.

24. I reserve the right to supplement and amend any of my opinions in this declaration based on documents, testimony, and other information that becomes available to me after the date of this declaration.

V. LEGAL STANDARDS

25. I am not a lawyer. My understanding of the legal standards to apply in reaching the conclusions in this declaration is based on discussions with counsel for Petitioner, my experience applying similar standards in other patent-related matters, and my reading of the documents submitted in this proceeding. In preparing this declaration, I have tried to faithfully apply these legal standards to the challenged claims.

26. I have been informed that there are two ways in which prior art may render a patent claim unpatentable. First, I have been informed that the prior art can “anticipate” a claim. Second, I have been informed that the prior art can render a claim “obvious” to a person of ordinary skill in the art. I understand that a claim is patentable if it was not anticipated and would not have been obvious by the prior art at the effective filing date of the patent.

27. I have been informed that a dependent claim is a patent claim that refers back to another patent claim. I have been informed that a dependent claim includes all of the limitations of the claim to which it refers.

28. I have been asked to provide my opinions as to whether the cited prior art discloses or renders obvious claims 1-18 of the '685 patent from the perspective of a person of ordinary skill in the art at the '685 patent's earliest claimed priority date in 2014, as described in more detail below.

29. I have been informed that in *inter partes* review proceedings, such as this one, the party challenging the patent bears the burden of proving unpatentability by a preponderance of the evidence. I understand that a preponderance of the evidence means "more likely than not."

30. For purposes of this declaration, I have been asked to provide my opinions on issues regarding unpatentability. I have been informed of the following legal standards, which I have applied in forming my opinions.

A. Level of Ordinary Skill

31. I have been informed that a person of ordinary skill in the art is determined by considering several factors, including the (i) type of problems encountered in the art; (ii) prior art solutions to those problems; (iii) rapidity with which innovations are made; (iv) sophistication of the technology; and (v) educational level of active workers in the field.

32. I have been instructed to assume that a person of ordinary skill in the art is not a specific real individual, but rather a hypothetical individual having the qualities reflected by the factors discussed above.

B. Prior Art

33. I have been advised and understand that the information used to evaluate whether an invention was new and not obvious when made is generally referred to as “prior art.” I understand that prior art includes patents and printed publications that existed before the earliest claimed priority date or the earliest filing date of the patent (which I have been informed is also called the “effective filing date”). I have been informed and understand that a patent or published patent application is prior art if it was filed before the earliest filing date of the claimed invention and that a printed publication is prior art if it was publicly available before the earliest filing date.

C. Anticipation

34. I have been informed that under 35 U.S.C. § 102, a patent claim is unpatentable for anticipation if the claimed subject matter was patented or described in a printed publication before the effective filing date of the claimed invention. I have been informed that this is referred to as unpatentability by anticipation. I have been informed that a patent claim is anticipated under § 102 if a single prior art reference discloses all of the limitations of the claimed invention.

D. Obviousness

35. I have been informed that for obviousness under 35 U.S.C. § 103, a patent claim is unpatentable if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have

been obvious to a person having ordinary skill in the art to which said subject matter pertains at the time the invention was made. I have been informed that this is referred to as unpatentability by obviousness.

36. I have been informed that an obviousness analysis includes the following considerations:

- a. Determining the scope and content of the prior art;
- b. Ascertaining the differences between the prior art and the claims at issue;
- c. Resolving the level of ordinary skill in the pertinent art; and
- d. Considering evidence of secondary indicia of nonobviousness (if available).

37. I have been informed that the relevant time for considering whether a claim would have been obvious to a person of ordinary skill in the art is the time of invention. For my obviousness analysis, counsel for Petitioner instructed me to assume that the date of invention for the challenged claims is April 3, 2014. My opinions would not change if I assumed another, e.g., later, date of invention.

38. I have been informed that a reference may be modified or combined with other references or with a person of ordinary skill in the art's own knowledge if the person would have found the modification or combination obvious. I have also been informed that a person of ordinary skill in the art is presumed to know all

of the relevant prior art, and the obviousness analysis may take into account the inferences and creative steps that a person of ordinary skill in the art would employ.

39. I have been informed that whether a prior art reference renders a patent claim obvious is determined from the perspective of a person of ordinary skill in the art. I have also been informed that, while there is no requirement that the prior art contain an express suggestion to combine known elements to achieve the claimed invention, and while a suggestion to combine known elements to achieve the claimed invention may come from the prior art as a whole or individually and may consider the inferences and creative steps a person of ordinary skill in the art would employ, as filtered through the knowledge of one skilled in the art, obviousness grounds cannot be sustained by mere conclusory statements and must include some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.

40. In determining whether a prior art reference could have been combined with another prior art reference or other information known to a person having ordinary skill in the art, I have been informed that the following principles may be considered:

- a. A combination of familiar elements according to known methods is likely to be obvious if it yields predictable results;

- b. The substitution of one known element for another is likely to be obvious if it yields predictable results;
- c. The use of a known technique to improve similar items or methods in the same way is likely to be obvious if it yields predictable results;
- d. The application of a known technique to a prior art reference that is ready for improvement to yield predictable results;
- e. Any need or problem known in the field and addressed by the reference can provide a reason for combining the elements in the manner claimed;
- f. A person of ordinary skill often will be able to fit the teachings of multiple references together like a puzzle; and
- g. The proper analysis of obviousness requires a determination of whether a person of ordinary skill in the art would have a “reasonable expectation of success”—but not “absolute predictability” of success—in achieving the claimed invention by combining prior art references.

41. I have been informed that, when a work is available in one field, design alternatives and other market forces can prompt variations of it, either in the same field or in another. I have been informed that if a person of ordinary skill in the art could have implemented a predictable variation and would have seen the

benefit of doing so, that variation is likely to have been obvious. I have been informed that, in many fields, there may be little discussion of obvious combinations, and in these fields, market demand—not scientific literature—may drive design trends. I have been informed that, when there was a design need or market pressure and there are a finite number of predictable solutions, a person of ordinary skill in the art would have had a good reason to pursue those known options.

42. I have been informed that the law permits the application of “common sense” in examining whether a claimed invention would have been obvious to a person skilled in the art. For example, I have been informed that combining familiar elements according to known methods and in a predictable way may suggest obviousness when such a combination would yield nothing more than predictable results. I understand, however, that a claim is not obvious merely because every claim element is disclosed in the prior art, and that a party asserting obviousness must still provide a specific motivation to combine or modify the references as recited in the claims and explain why one skilled in the art would have reasonably expected to succeed in doing so.

43. I have been informed that there is no rigid rule that a reference or combination of references must contain a “teaching, suggestion, or motivation” to combine references. But I also understand that the “teaching, suggestion, or

motivation” test can be a useful guide in establishing a rationale for combining elements of the prior art. I have been informed that this test poses the question as to whether there is an express or implied teaching, suggestion, or motivation to combine prior art elements in a way that realizes the claimed invention, and that it seeks to counter impermissible hindsight analysis.

44. I am not aware of any evidence of secondary considerations that would support a determination of nonobviousness of the claimed subject matter in the '685 patent.

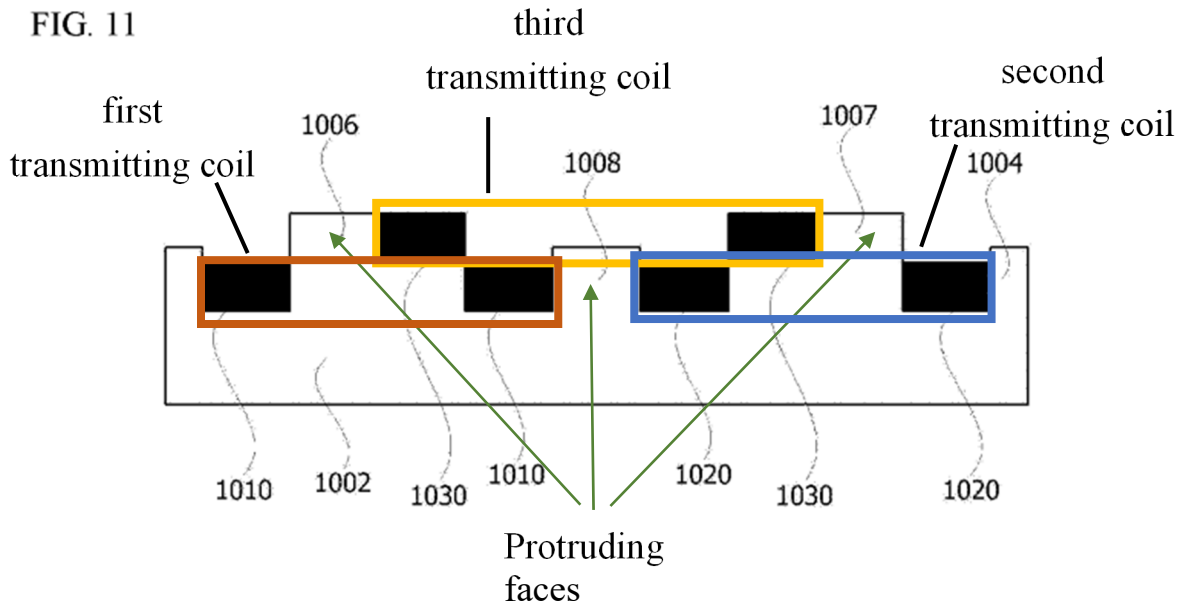
45. I have been informed that, in an obviousness analysis, prior art must be analogous prior art to the patent being considered. I have been informed that a prior art reference is considered to be analogous, or in the same field of art, if the reference is either (1) in the same field of endeavor as the challenged patent, regardless of the problems the challenged patent and the prior art address, or (2) reasonably pertinent to the particular problem being solved by the challenged patent.

VI. THE '685 PATENT

46. The '685 patent generally relates to a wireless power transmitter including “a transmitting coil and a soft magnetic substrate.” Ex. 1001, 1:52-58. As illustrated in Figures 10-13, the wireless power transmitter may include transmitting coils 1010, 1020, and 1030 and a soft magnetic substrate 1000.

Ex. 1001, 7:1-3, FIGS. 10-13. The substrate includes a wall 1004 “surround[ing] at least a part of the outer circumference” of the transmitting coils and “may further include at least one of protruding faces 1006, 1007, and 1008.” Ex. 1001, 7:31-35, 7:51-53.

47. As seen in Figure 11 below, “[t]he protruding face 1006 may be surrounded by an inner circumference 1014 of the transmitting coil 1010 and an outer circumference 1032 of the transmitting coil 1030, and the protruding face 1007 may be surrounded by an inner circumference 1024 of the transmitting coil 1020 and the outer circumference 1032 of the transmitting coil 1030, and the protruding face 1008 may be surrounded by an outer circumference 1012 of the transmitting coil 1010, an outer circumference 822 of the transmitting coil 1020 and an inner circumference 1034 of the transmitting coil 1030.” Ex. 1001, 7:51-62.



Ex. 1001, FIG. 11 (annotated).

VII. CLAIM CONSTRUCTION

48. I have been instructed that the “intrinsic record” includes the ’685 patent itself, including the claims, description, and figures (Ex. 1001), and the ’685 patent’s prosecution history—which I understand is the record of proceedings at the U.S. Patent and Trademark Office (“Patent Office”) concerning the patent (Ex. 1002). I understand that, like the claims and written description, the prosecution history provides evidence to a person of ordinary skill in the art of how the inventor intended their patent to be understood, and how the Patent Office understood the patent. I understand that the inventor is permitted to apply a special definition to the terms or to limit the scope of claim terms in their patent claims, which may differ from the term’s plain and ordinary meaning. That special

definition or limitation on scope may be provided in the patent's written description, the patent's prosecution history, or both.

49. I understand that claim interpretation may also be informed by "extrinsic evidence" (that is, evidence outside of the patent record itself). I have been informed that extrinsic evidence may include dictionaries, technical treatises, and other materials evidencing the meaning of a claim term and the understanding held by a person of ordinary skill in the art in the relevant time period.

50. I have been asked for purposes of this declaration to apply the plain and ordinary meaning of the claim terms as they would have been understood by a person of ordinary skill in the art at the earliest claimed priority date of the '685 patent.

51. I understand that no claim term's construction is in dispute at this time. Based on my review of these materials and my personal knowledge and experience, I have considered each term of the '685 patent as it would have been understood by a person of ordinary skill in the art at the earliest claimed priority date of April 3, 2014.

VIII. LEVEL OF ORDINARY SKILL IN THE ART

52. In rendering the opinions set forth in this declaration, I have been asked to consider the '685 patent's claims and the prior art through the eyes of a person of ordinary skill in the art (which I may also refer to as "one skilled in the

art,” “skilled artisan,” “POSITA,” or similar variations). I have considered factors such as the educational level and years of experience of those working in the pertinent art, the types of problems encountered in the art, the teachings of the prior art, patents and publications of other persons or companies, and the sophistication of the technology.

53. Taking the factors described in the Legal Standards – Level of Ordinary Skill section into consideration, it is my opinion that a POSITA would have had at least a bachelor’s degree in electrical engineering or related engineering discipline, and at least two years of experience in wireless power transfer and circuit design. Relevant work experience can substitute for formal education and additional education could substitute for work experience.

54. I met the criteria for a POSITA at the earliest priority date of the ’685 patent.

IX. THE PRIOR ART

55. In forming my opinions, I found the following prior art relevant when considering whether the claims of the ’685 patent would have been obvious to a person of ordinary skill in the art.

Exhibit	Description
Ex. 1005	U.S. Patent Application Publication No. 2013/0069586 to Jung et al. (“Jung”)

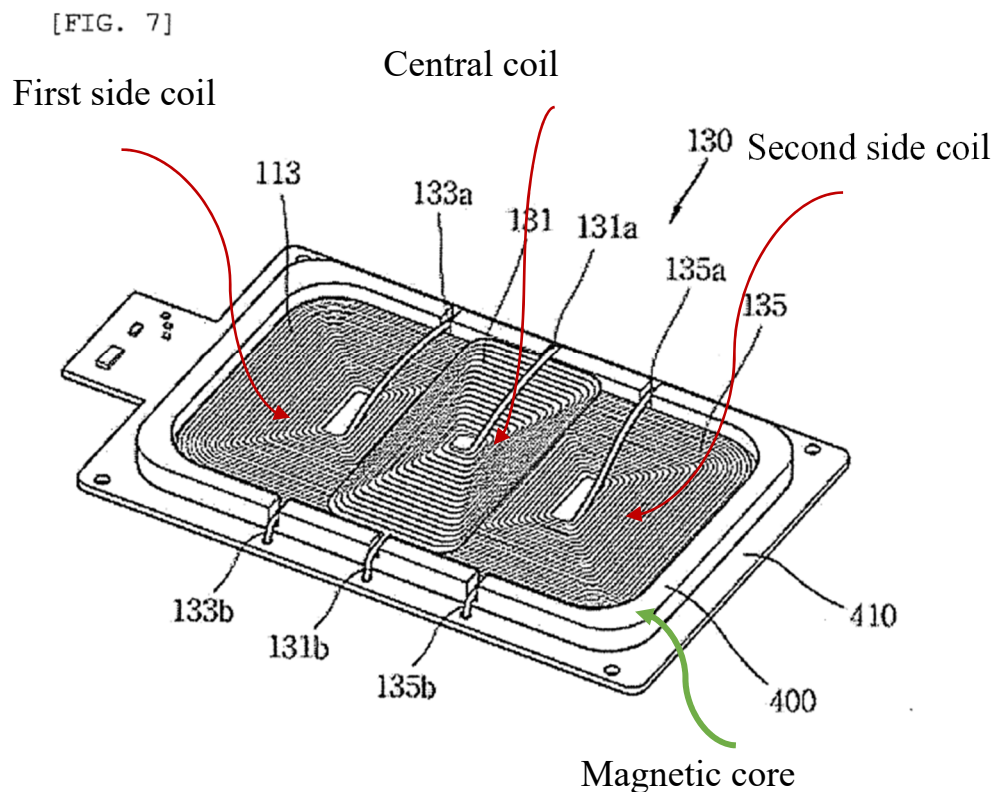
Exhibit	Description
Ex. 1006	U.S. Patent Application Publication No. 2010/0007215 to Sakuma et al. (“Sakuma”)
Ex. 1007	U.S. Patent No. 10,186,912 to Stamenic et al. (“Stamenic”)
Ex. 1008	U.S. Patent Application Publication No. 2012/0154086 to Willemsen et al. (“Willemsen”)
Ex. 1009	U.S. Patent Application Publication No. 2013/0015719 to Jung et al. (“Jung 719”)
Ex. 1014	U.S. Patent Application Publication No. 2012/0161535 to Jung et al. (“Jung 535”)
Ex. 1015	U.S. Patent Application Publication No. 2013/0181668 to Tabata et al. (“Tabata”)
Ex. 1016	U.S. Patent Application Publication No. 2011/0050382 to Baarman et al. (“Jung 718”)
Ex. 1017	U.S. Patent Application Publication No. 2013/0300204 to Partovi (“Partovi”)
Ex. 1018	U.S. Patent Application Publication No. 2012/0313742 to Kurs et al. (“Kurs”)
Ex. 1019	U.S. Patent Application Publication No. 2013/0249302 to An et al. (“An”)

56. As explained below, in my opinion, claims 1-18 of the '685 patent would have been obvious based on Jung and Sakuma as discussed below.

A. Jung (U.S. Patent Application Publication No. 2013/0069586)

57. Jung published as U.S. Patent Application No. 2013/0069586 on March 21, 2013, and was filed September 21, 2012. I understand and have been asked to assume that Jung is prior art to the '685 patent.

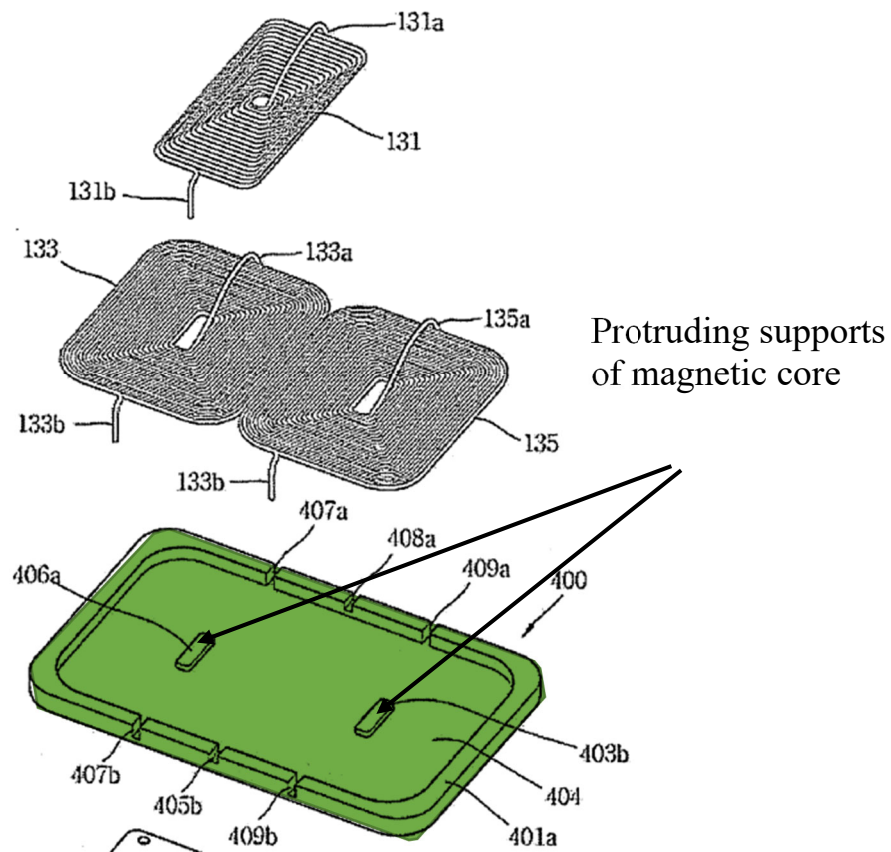
58. Jung discloses “a wireless power transmitting apparatus” Jung, Abstract, [0003], FIG. 7. The apparatus includes “a core assembly including one central coil, and two side coils to transmit a power to a power receiving apparatus” and “a magnetic core formed to receive the central coil, the first side coil, and the second side coil therein,” whereby the side coils are disposed on a different “level” than the central coil so that “portions” of the side coils “are overlapped with the central coil.” Jung, [0020], [0025], FIG. 7.



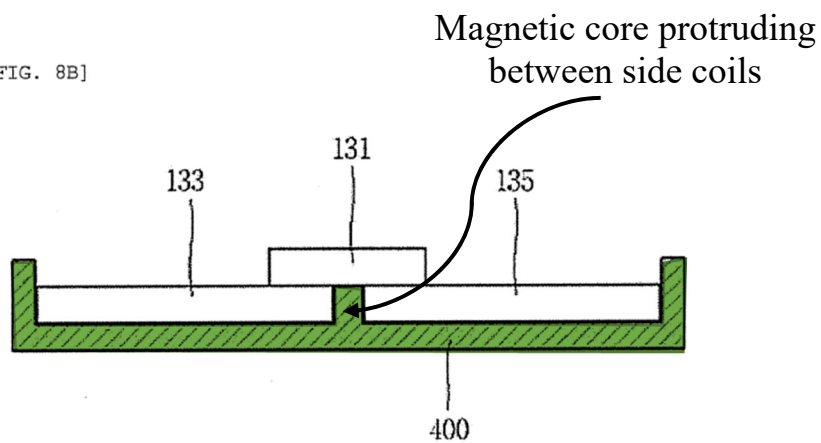
Jung, FIG. 7 (annotated).

59. The magnetic core includes supports “protrudedly formed on a bottom surface thereof” and located “at positions at which they may be inserted into hollow parts formed at the center of the first and second side coils.” Jung, [0140]. The first and second side coils “may be installed to be spaced apart from each other by a predetermined interval, as shown in FIG. 8B,” and the magnetic core “may be protrudedly formed between the first and second side coils.” Jung, [0145]-[0146].

[FIG. 6]



[FIG. 8B]

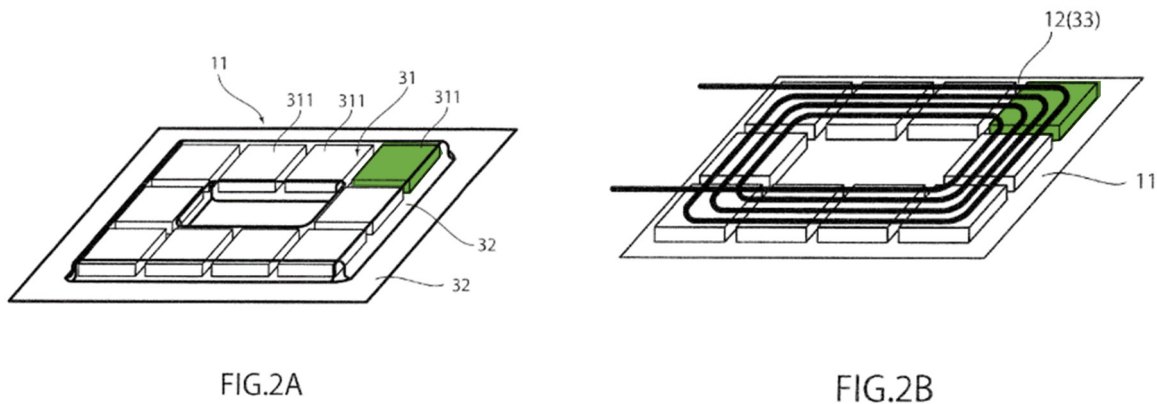


Jung, FIGS. 6, 8B (annotated).

B. Sakuma (U.S. Patent Application Publication No. 2010/0007215)

60. Sakuma published on January 15, 2010, as U.S. Patent Application Publication No. 2010/0007215, and was filed on July 8, 2009. I understand and have been asked to assume that Sakuma is prior art to the '685 patent.

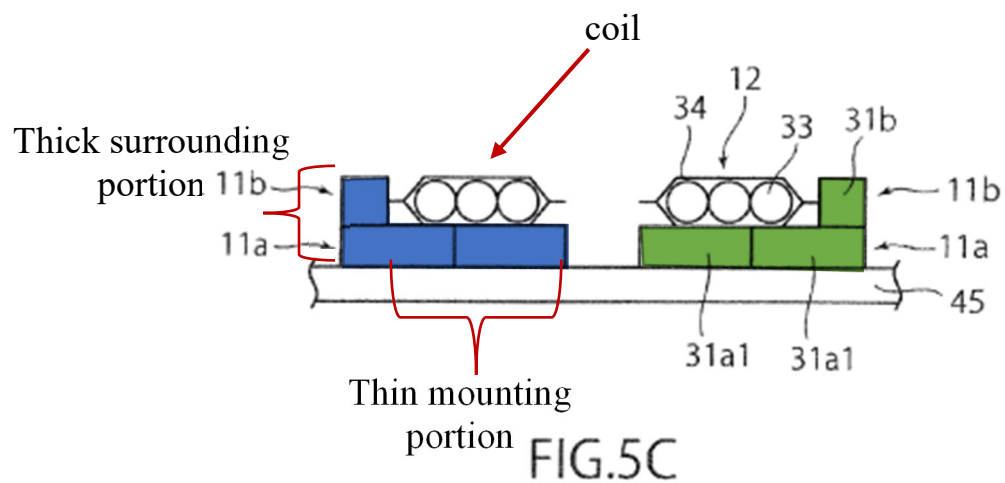
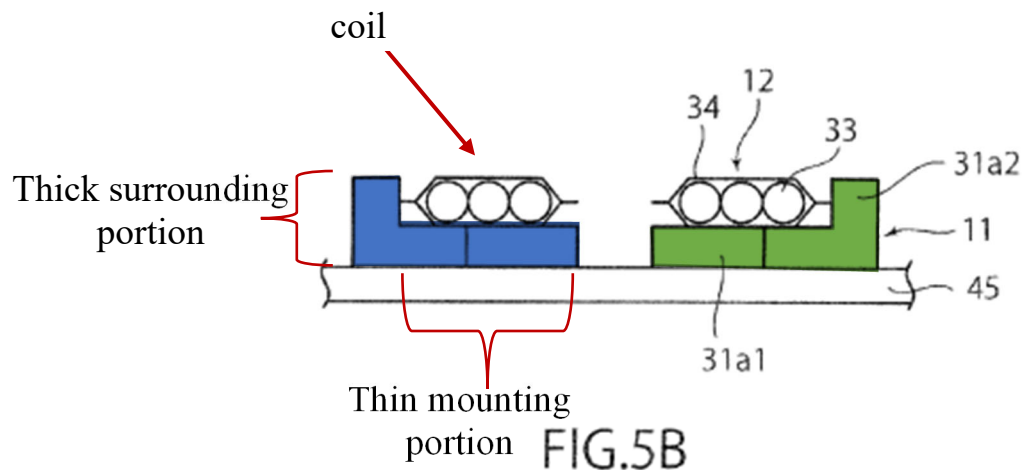
61. Sakuma teaches a “power transmitter” including a “soft magnetic sheet” 21 including multiple “soft magnetic pieces” 311 protruding from a surface of the substrate, and a power transmitter coil. Sakuma, [0034], [0037]-[0039], [0042], FIGS. 1, 2A, 4. Soft magnetic sheet 21 has “the same structure as the soft magnetic sheet 11” of the power receiver illustrated in Figures 2A and 4. Sakuma, [0033], FIGS. 2A, 4. The soft magnetic protrusions, like the first and second supports of Jung, support the power transmitter coil. Sakuma, Abstract, [0033], FIG. 2B.



Sakuma, FIGS. 2A-2B (annotated).

62. Sakuma further teaches an alternate embodiment having “L-shaped” protrusions configured to not only support, but surround, a portion of the coil.

Sakuma, [0038], FIGS. 5B-5C. The L-shaped magnetic piece “has a thinner section and a thicker section, wherein the thinner section serves as the mount portion, while the thicker portion serves as the surrounding portion.” Sakuma, [0038].



Sakuma, FIGS. 5B-5C (annotated).

C. Kurs (U.S. Patent Application Publication No. 2012/0313742)

63. Kurs published on December 13, 2012, as U.S. Patent Application Publication No. 2010/0007215, and was filed on June 28, 2012. I understand and have been asked to assume that Kurs is prior art to the '685 patent.

D. Jung, Sakuma, and Kurs are analogous art to the '685 patent

64. Taking into consideration the test for “analogous art” discussed above, it is my opinion that Jung and Sakuma are analogous art to the '685 patent because each reference, like the '685 patent, is directed to the same technical field:

“wireless charging, and more specifically, a wireless power transmitting apparatus included in a wireless charging system.” *Compare* Ex. 1001, 1:21-23, *with* Jung, [0003] (“The present invention relates to a wireless power transmitting apparatus and method of selecting at least one of one central coil disposed at the center of a core and two side coils each disposed at left and right sides of the core as a power transmitting coil”); Sakuma, [0002] (“This invention relates to a non-contact or contactless power transmission system based on electromagnetic induction between coils.”); Kurs, [0009] (“This disclosure relates to wireless energy transfer, also referred to as wireless power transmission.”)

X. GROUNDS OF UNPATENTABILITY

65. Based on my review of the materials set forth above, including my application of the knowledge of a person of ordinary skill in the art, it is my

opinion that claims 1-18 of the '685 patent would have been obvious to one of ordinary skill in the art.

66. In particular, it is my opinion that claims 1-18 of the '685 patent would have been obvious to a person of ordinary skill in the art based on the following combination:

Ground	Claim(s) Challenged	35 U.S.C. §	References
1	1-18	103	Jung and Sakuma
2	6, 12, and 18	103	Jung, Sakuma, and Kurs

XI. THE CHALLENGED CLAIMS ARE UNPATENTABLE BASED ON THE PRIOR ART

67. In my opinion, claims 1-18 would have been obvious to one skilled in the art at the earliest priority date of the '685 patent.

A. Ground 1: Claims 1-18 are Obvious over Jung and Sakuma

1. Independent Claim 1

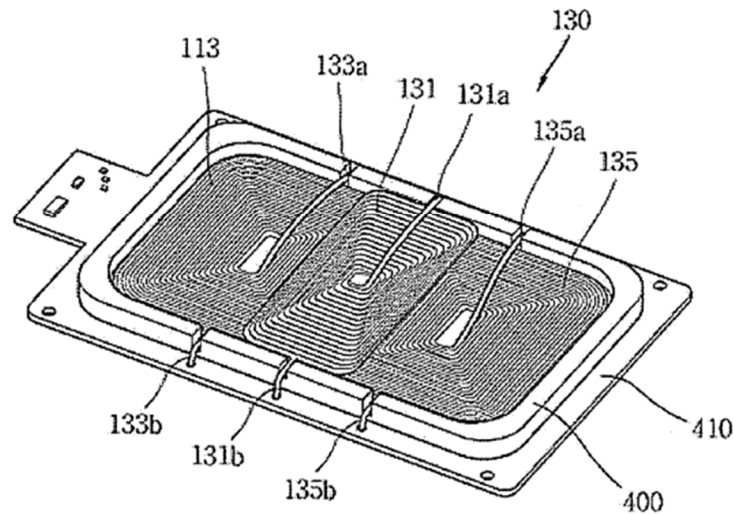
68. Jung discloses or renders obvious claim 1.

a. [1Preamble] “A wireless power transmitter comprising:”

69. To the extent the preamble is limiting, Jung discloses it because Jung discloses a “wireless power transmitting apparatus.” Jung, Abstract, [0003], FIG.

7.

[FIG. 7]



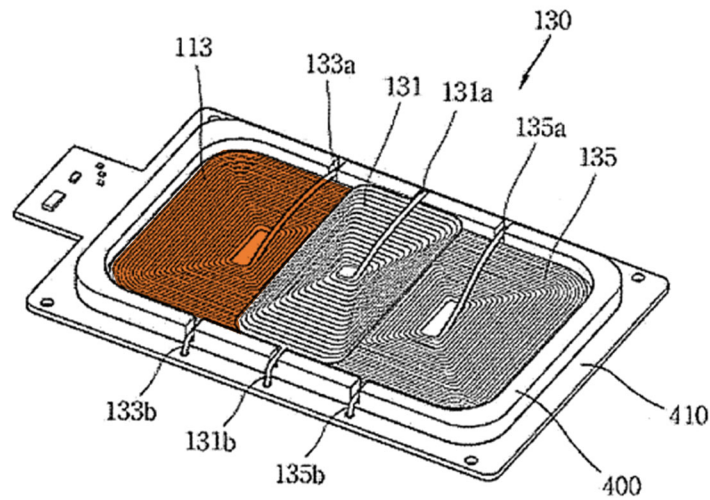
Jung, FIG. 7.

b. [1a] “a first transmitting coil;”

70. Jung discloses [1a].

71. The power transmitting apparatus has core assembly 130 including “one central coil, and two side coils to transmit a power to a power receiving apparatus.” Jung, [0020]. For example, the core assembly includes a central coil 131, “a first side coil 133 and a second side coil 135” for transmitting power to a power receiving apparatus. Jung, [0020], [0056] (emphasis added), FIGS. 7-8B. The **first side coil** is a first transmitting coil. Jung, [0056], [0059].

[FIG. 7]



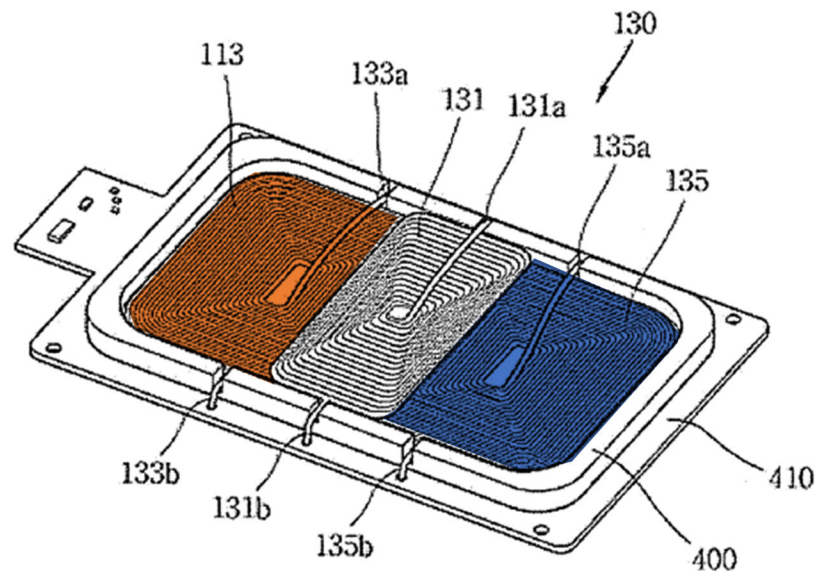
Jung, FIG. 7 (annotated).

c. [1b] “second transmitting coil;”

72. Jung discloses or renders obvious [1b].

73. As explained for [1a], the transmitting coils include “a second side coil 135.” Jung, [0020], [0056], FIGS. 7-8B. [Second side coil 135](#) is a second transmitting coil. Jung, [0056], [0059].

[FIG. 7]



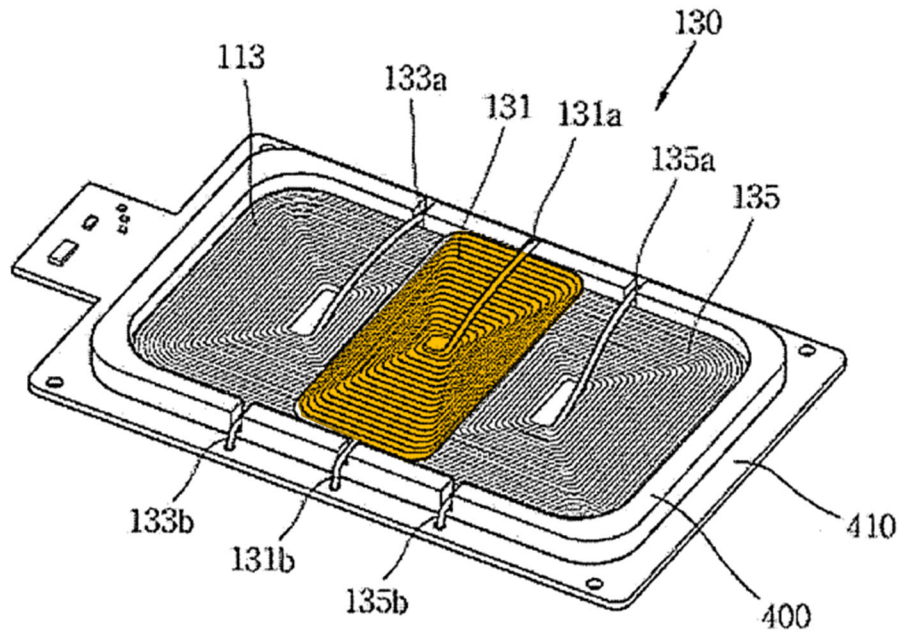
Jung, FIG. 7 (annotated).

- d. [1c] “a third transmitting coil on the first transmitting coil and the second transmitting coil;”

74. Jung discloses [1c].

75. As explained for [1a], the transmitting coils include a “central coil 131.” Jung, [0020], [0056]. **Central coil 131** is a third transmitting coil on the first and second side coils (transmitting coils) 133, 135. Jung, [0025], [0056], FIGS. 7-8B.

[FIG. 7]



Jung, FIG. 7 (annotated).

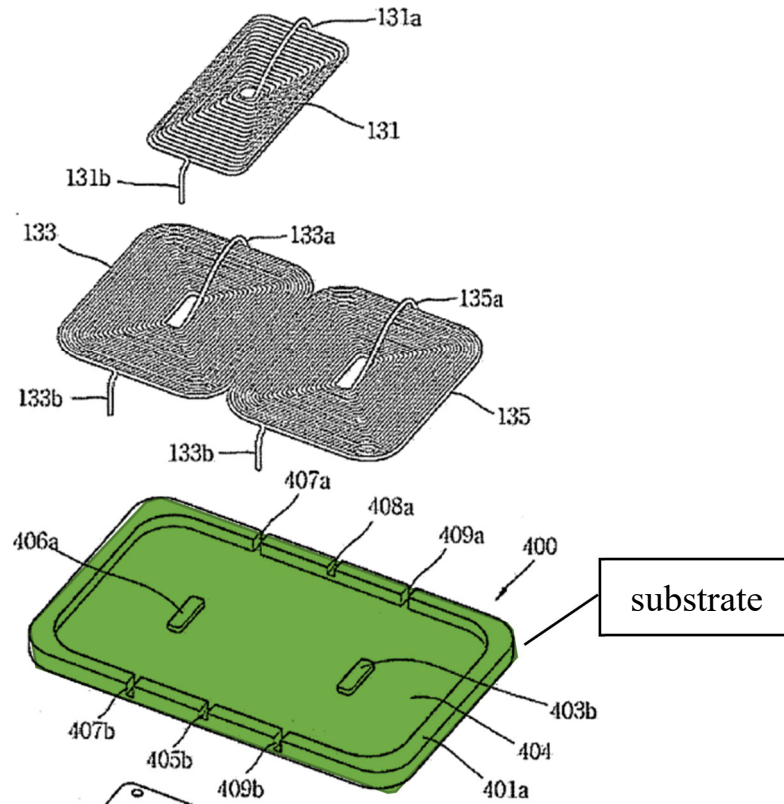
- e. **[1d] “and a substrate to accommodate the first transmitting coil, the second transmitting coil, and the third transmitting coil, wherein the substrate comprises:”**

76. Jung discloses [1d].

77. The power transmitting device also includes a “magnetic core formed to receive the central coil, the first side coil, and the second side coil therein.” Jung, [0025]. For example, as illustrated in Figure 7, core 400 forms a substrate “made of a magnetic material and receives the one central coil 131 and the two side coils 133 and 135 therein.” Jung, [0025], [0127], FIGS. 6-8B. The ’685 patent does not define “substrate,” but explains that the “magnetic substrate 1000,” like

Jung's magnetic core 400, "accommodates transmitting coils 1010, 1020, and 1030." Ex. 1001, 7:1-3.

[FIG. 6]



Jung, FIG. 6 (annotated).

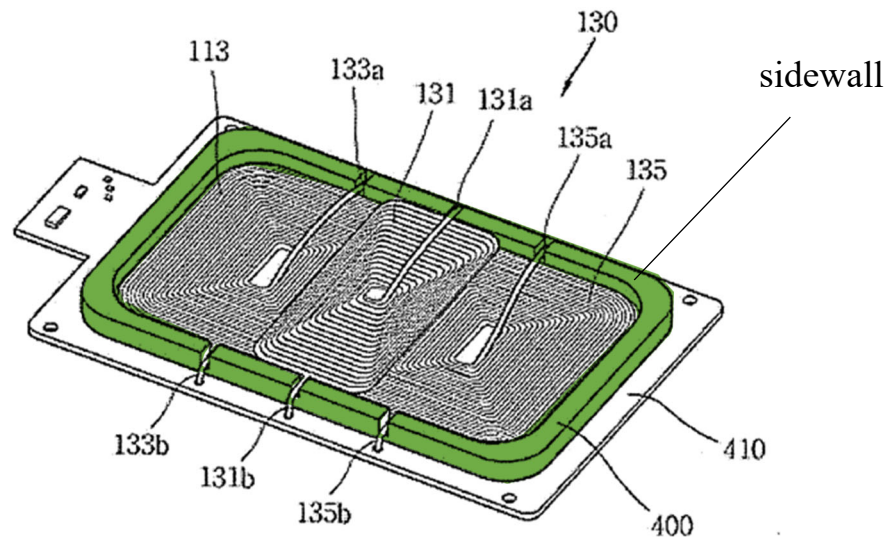
- f. [1e] "a wall to surround a part of an outer circumference of the first transmitting coil and a part of an outer circumference of the second transmitting coil;"

78. Jung discloses [1e].

79. As explained for [1d], Jung's power transmitting device includes a magnetic core (substrate). Jung, [0025], [0127], FIGS. 6-8B. As illustrated in

annotated Figure 7 below, the core (substrate) includes “a sidewall 401a protruding upwardly along an outer circumferential edge of the core 400” that surrounds an outer circumference of the central and side transmitting coils. Jung, [0133], [0137], [0138], FIGS. 6-7. Thus, Jung discloses a wall surrounding a part of an outer circumference of the first and second transmitting coils.

[FIG. 7]



Jung, FIG. 7 (annotated).

g. [1f] “a first protrusion inside an inner circumference of the first transmitting coil;”

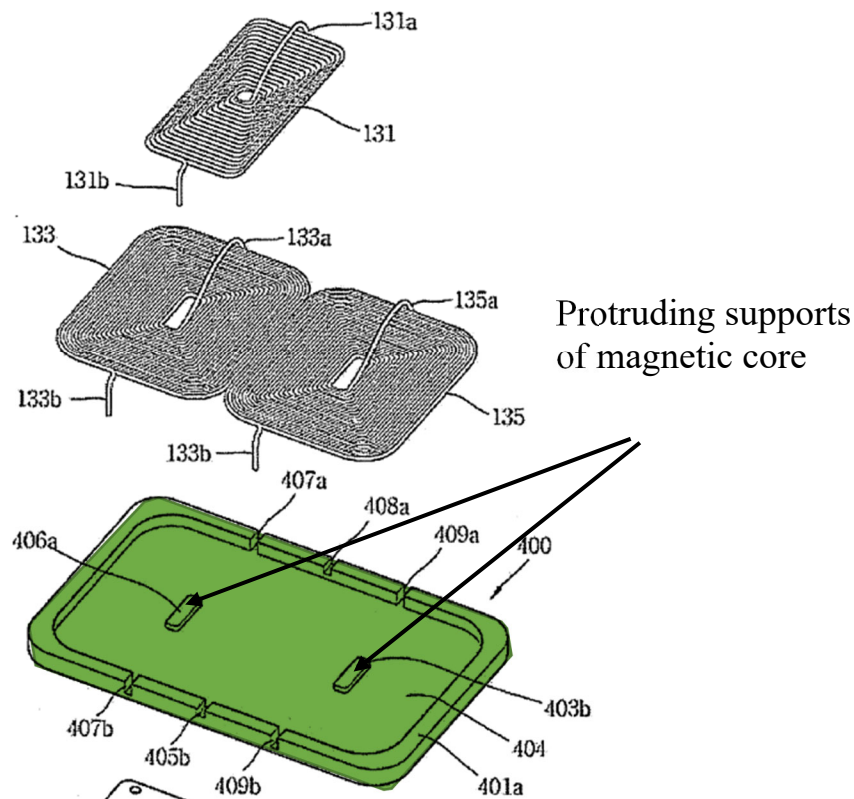
80. Jung discloses [1f].

81. As explained for [1d]-[1e], Jung’s power transmitting device includes a magnetic core (substrate) comprising a wall surrounding the central and side coils. Jung, [0025], [0127], [0133], [0137], [0138], FIGS. 6-8B. The core also

includes a first protrusion 403a inside a hollow part (inner circumference) of the first side coil 133. Jung, [0140]-[0141], FIGS. 6-7.

82. More specifically, the core includes “two supports 403a and 403b protrudedly formed on a bottom surface thereof” and “formed at positions at which they may be inserted into hollow parts formed at the center of the first and second side coils 133 and 135, respectively.” Jung, [0140]-[0141], FIGS. 6-7.

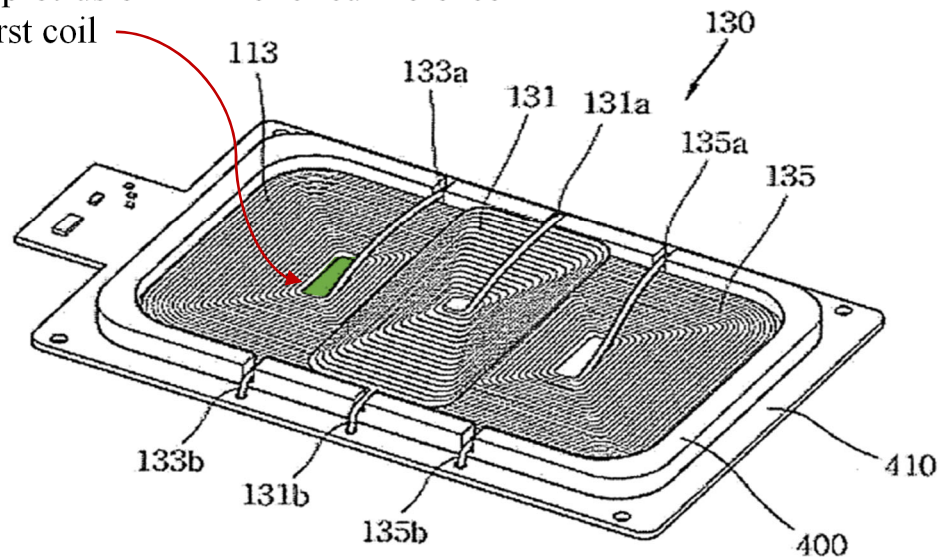
[FIG. 6]



Jung, FIG. 6 (annotated, excerpted).

[FIG. 7]

first protrusion in inner circumference
of first coil



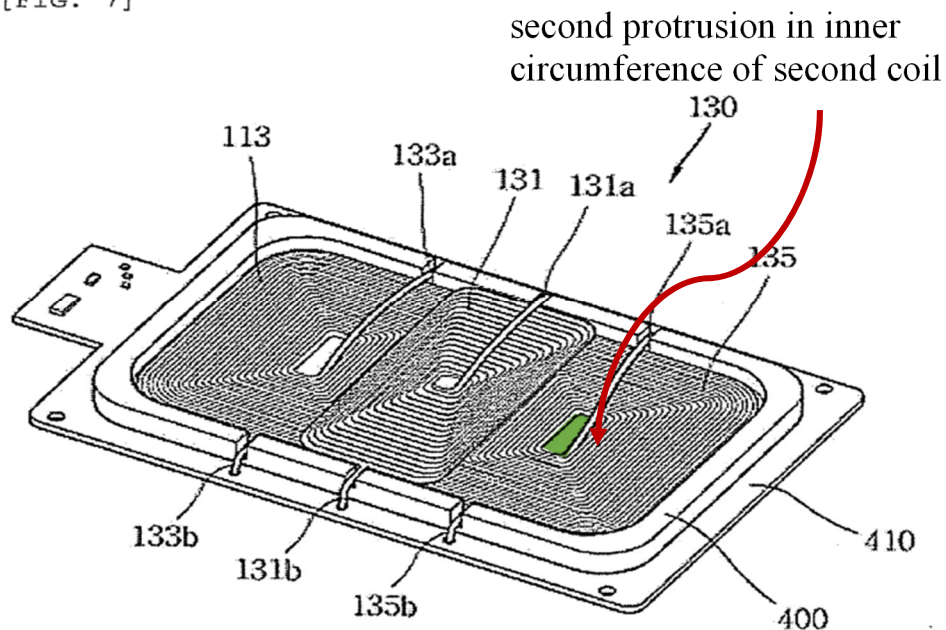
Jung, FIG. 7 (annotated).

h. [1g] “and a second protrusion inside an inner circumference of the second transmitting coil,”

83. Jung discloses [1g].

84. As explained for [1f], the core includes “two supports 403a and 403b protrudedly formed on a bottom surface thereof” and “formed at positions at which they may be inserted into hollow parts formed at the center of the first and second side coils 133 and 135, respectively.” Jung, [0140]-[0141], FIGS. 6-7. Thus, Jung discloses a second protrusion 403b inside a hollow part (inner circumference) of the second side coil 135.

[FIG. 7]



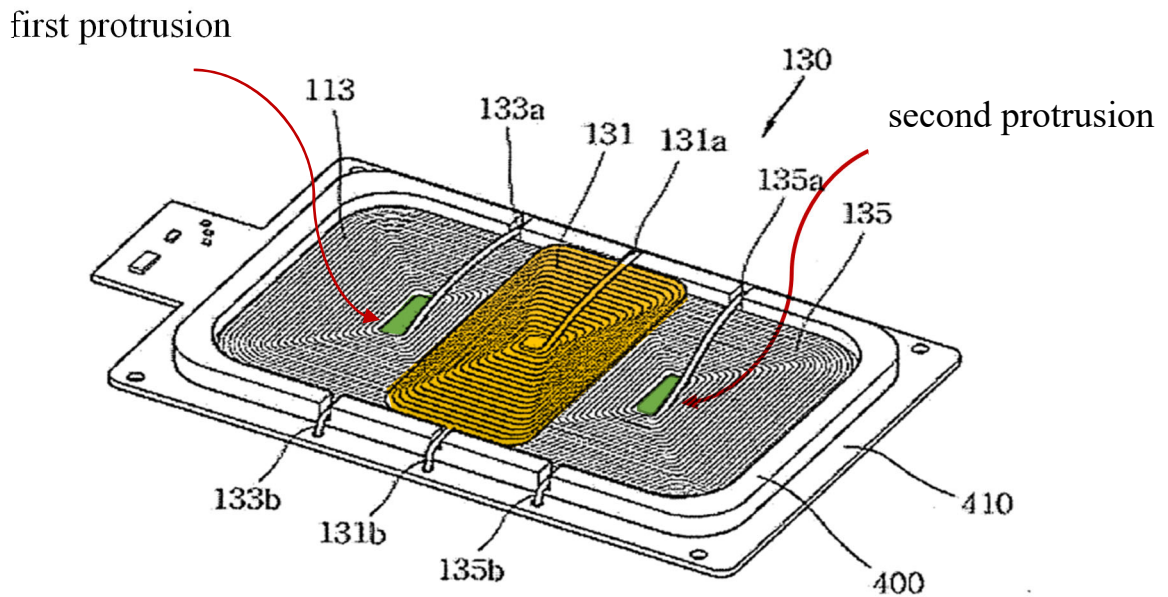
Jung, FIG. 7 (annotated).

- i. [1h] “wherein the third transmitting coil is disposed between the first protrusion and the second protrusion,”

85. Jung discloses [1h].

86. As seen in Figures 6-7, the central (third) transmitting coil is disposed between the first and second supports (protrusions) 403a and 403b. Jung, [0140], [0141], FIGS. 6-7.

[FIG. 7]



Jung, FIG. 7 (annotated).

- j. [1i] “wherein the first protrusion comprises a first stepped portion to support the third transmitting coil, and wherein the second protrusion comprises a second stepped portion to support the third transmitting coil.”**

87. Jung and Sakuma render obvious [1i].

88. Jung discloses that the first and second protrusions support the third transmitting coil because Jung discloses configuring the width of the third coil to overlap with and rest on the first and second supports (protrusions). Jung, [0026]-[0031], [0131], FIG. 9.

89. More specifically, Jung discloses that the “width of the central coil in the first direction may be in the range of 30 to 50% of the sum of widths of the first side coil and the second side coil in the first direction,” that “[t]he first side coil

and the second side coil may have the same size,” and that “the one central coil 131 may also have a size equal to or larger than that of each of the first and second side coils 133 and 135, as needed.” Jung, [0028], [0031], [0131], [0153].

90. A POSITA would have understood that for configurations in which the central coil is the same size or larger than the side coils, the central coil at least partially overlaps the first and second supports. Thus, Jung discloses that the first and second supports (protrusions) support the central (third) coil because the central coil rests on the protrusions. Indeed, it was well known in the art at the time of the invention to use magnetic protrusions to support a transmission coil. Jung 719, [0064]-[0065], FIGS. 2-3 (illustrating supports 154, 155 protruding from a magnetic core and supporting a main (central) coil 111); Sakuma, FIGS. 2B, 5B-5C (illustrating magnetic protrusions for supporting a transmission coil).

FIG. 2

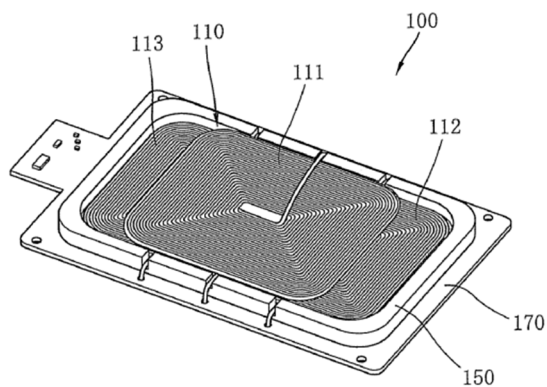
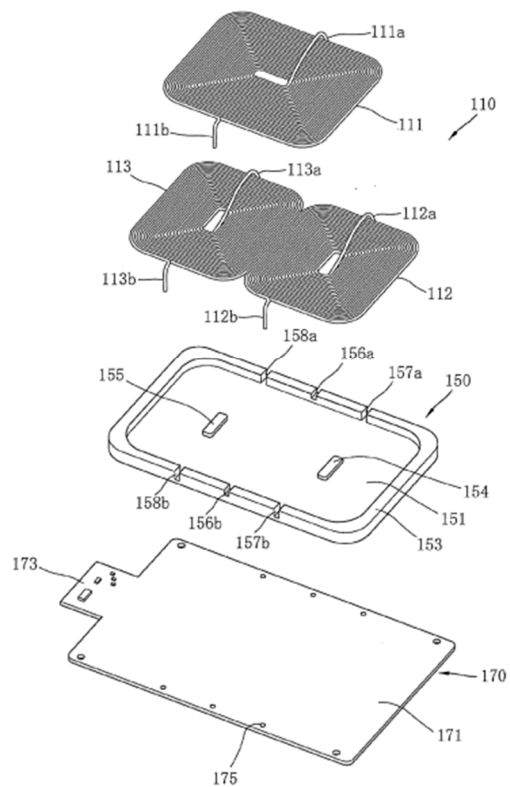


FIG. 3



Jung 719, FIGS. 2-3

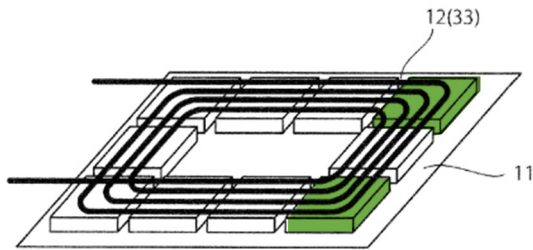


FIG.2B

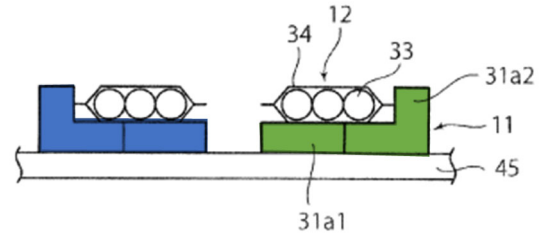


FIG.5B

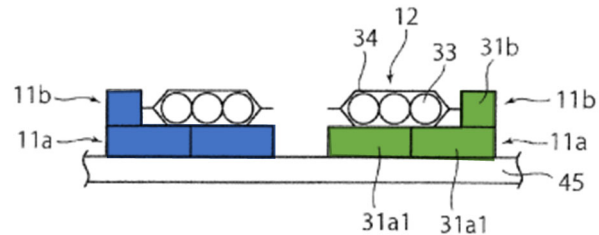


FIG.5C

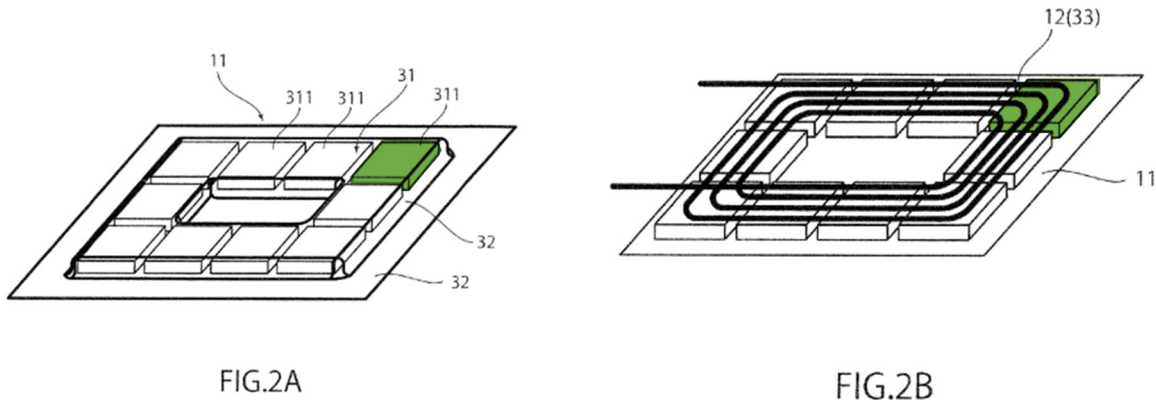
Sakuma, FIGS. 2B, 5B-5C.

91. Jung does not expressly teach that the protrusion has a stepped portion, but Sakuma renders this feature obvious.

92. Sakuma teaches a “power transmitter” including a “soft magnetic sheet” 21, i.e., substrate, including multiple “soft magnetic pieces” 311 protruding from a surface of the substrate, and power transmitter coil. Sakuma, [0034], [0037]-[0039], FIGS. 2A, 4. Soft magnetic sheet 21 has “the same structure as the soft magnetic sheet 11” of the power receiving apparatus illustrated in Figures 2A and 4. Sakuma, [0033], FIGS. 1, 2A, 4. The **soft magnetic protrusions**, like the first

and second supports (protrusions) of Jung, support the power transmitter coil.

Sakuma, Abstract, [0033], FIG. 2B.

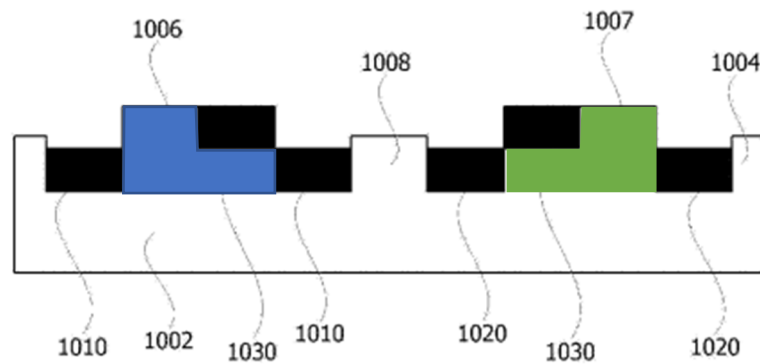


Sakuma, FIGS. 2A-2B (annotated).

93. Sakuma further teaches an alternate embodiment having “L-shaped” protrusions. Sakuma, [0038]. The L shape forms a stepped portion and is configured to not only support, but surround, a portion of the coil. Sakuma, [0038], FIGS. 5B-5C. More specifically, the L-shaped magnetic piece (protrusion) “has a thinner section and a thicker section, wherein the thinner section serves as the mount portion, while the thicker portion serves as the surrounding portion.” Sakuma, [0038]. The change in thickness that gives rise to the L shape “enhances power transmission characteristics” and forms a stepped portion for supporting the transmission coil. Sakuma, [0038]; *compare* Ex. 1001, FIG. 11 (annotated), *with* Sakuma, FIGS. 5B-5C (annotated). A POSITA would have found it obvious to substitute the first and second supports of Jung with the L-shaped supports of

Sakuma, or to alternatively modify the supports of Jung to have a thinner section and a thicker section, wherein “the thinner section serves as the mount portion” for supporting the main coil, and “the thicker portion serves as the surrounding portion” surrounding the main coil. Sakuma, [0038].

FIG. 11



Ex. 1001, FIG. 11 (annotated).

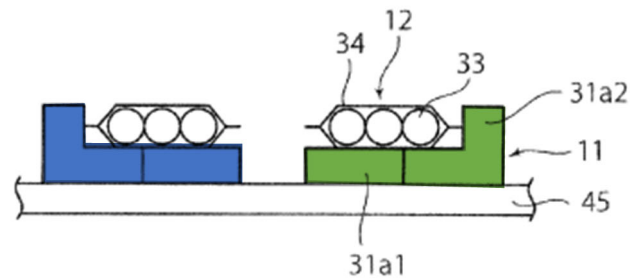


FIG. 5B

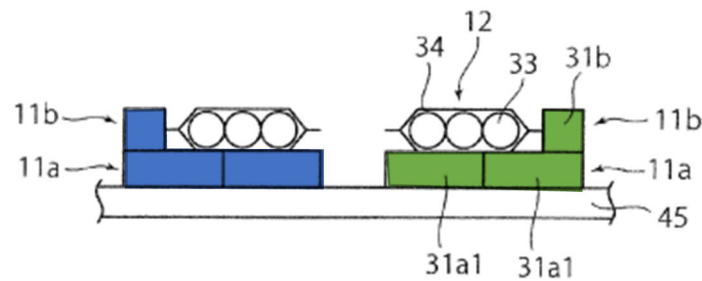


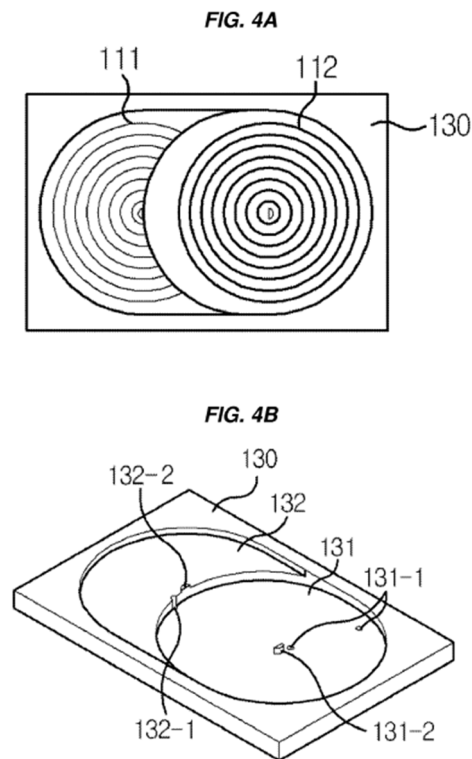
FIG. 5C

Sakuma, FIGS. 5B-5C (annotated).

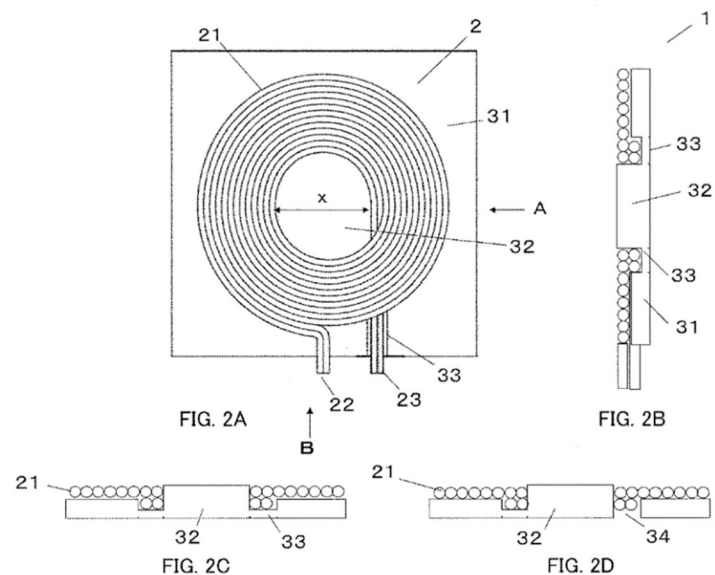
i. Motivation to Combine

94. Jung's central coil is secured using "double-sided tape," (Jung, [0141]); but such adhesives were known to degrade over time and upon repeated exposure to heat and vibration caused by e.g., placing, adjusting, and charging a power receiving device. A POSITA would have been motivated to substitute (or modify) the planar protrusions of Jung with the stepped L-shaped protrusions that surround at least a portion of the transmission coil to avoid the known drawbacks of adhesives, and to further stabilize the position of the central coil by surrounding,

and thereby preventing, e.g., lateral movement of the central coil. Indeed, it was well known in the art at the time of the invention to implement a stepped structure (instead of a planar one) to ensure the proper placement of transmission coils on a substrate. Jung 535, [0062] (describing a “step difference” “formed between” overlapping transmission coils); Tabata, FIGS. 2A-2D (illustrating a magnetic sheet of a non-contact charging station including a stepped structure formed by recess 33 for receiving and retaining a transmission coil 21).



Jung 535, FIGS. 4A-4B.



Tabata, FIGS. 2A-2D.

ii. Expectation of Success

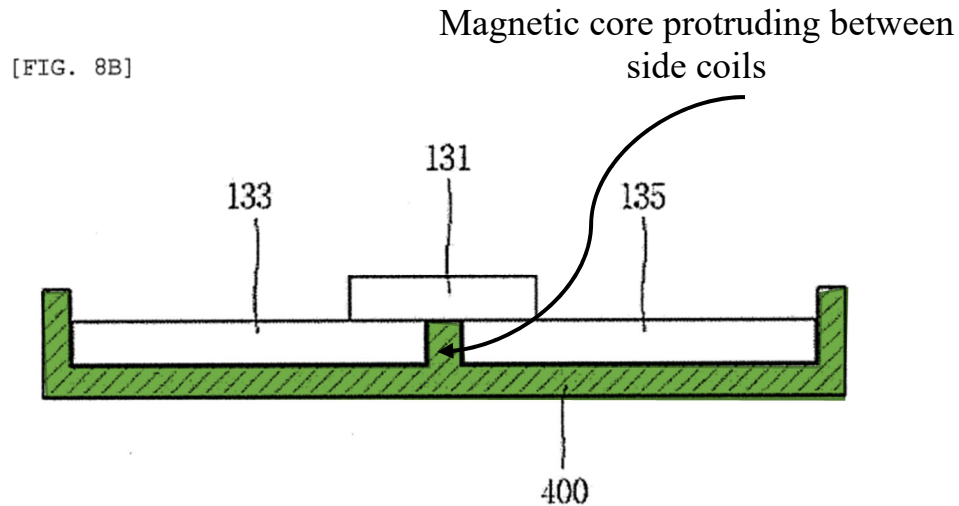
95. A POSITA would have had a reasonable expectation of success in making the modification or substitution because it would have merely required altering the protrusion's shape and/or dimensions using known techniques such as injection molding. Furthermore, the L-shape protrusion is a suitable alternative to planar protrusions (as taught by Sakuma) and to the adhesive method of securing a transmission coil to a core (substrate), as evidenced by Jung.

2. Claim 2: “The wireless power transmitting apparatus of claim 1, wherein the substrate comprises a third protrusion disposed between the first transmitting coil and the second transmitting coil.”

96. Jung discloses the additional limitations of claim 2.

97. As discussed for [1a]-[1b], the wireless power transmitting device includes first and second side coils (transmission coils) 133 and 135. Jung, [0056].

98. Jung further discloses that the substrate (core) forms a third protrusion disposed between the first and second side coils when they are spaced apart. Jung, [0145]-[0146], FIG. 8B. Specifically, Jung discloses that “the first and second side coils 133 and 135 may be installed to be spaced apart from each other by a predetermined interval, as shown in FIG. 8B,” such that “the core 400 may be protrudedly formed between the first and second side coils 133 and 135.” Jung, [0145]-[0146] (emphasis added), FIG. 8B.



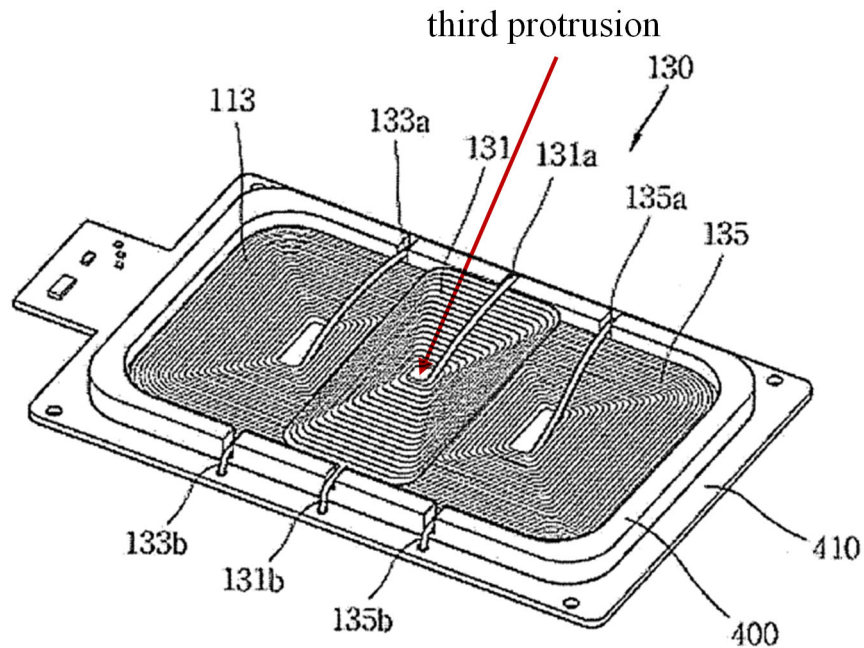
Jung, FIG. 8B (annotated).

3. Claim 3: “The wireless power transmitting apparatus of claim 2, wherein the third protrusion is disposed in an inner circumference of the third transmitting coil.”

99. Jung discloses or renders obvious the additional limitations of claim 3.

100. As discussed for claim 2, the core forms a third protrusion disposed between the first and second side coils. Jung, [0145]-[0146], FIG. 8. The protrusion is also aligned with the center and inner circumference of the main coil (third transmission coil) such that it is disposed in the inner circumference of the main coil. Jung, FIGS. 7, 8B.

[FIG. 7]



Jung, FIG. 7 (annotated).

101. To the extent Patent Owner disputes that the third protrusion extends in an inner circumference of the main coil, as recited in claim 3, a POSITA would have found it obvious to do so.

102. As explained for [1g]-[1h], Jung discloses first and second supports (protrusions) 403a, 403b extending into the “inner circumferential surfaces of the hollow parts of the first and second side coils.” Jung, [0140]-[0141], FIGS. 6-7. By protruding into inner circumferential surfaces of the hollow parts, the supports ensure that the positions of the side coils are “fixed” so that they do not “deviate[] from set positions.” Jung, [0140].

a. Motivation to Combine

103. A POSITA would have found it obvious and been motivated to similarly configure the third protrusion to extend into the inner circumferential surface of the hollow part of the main coil to provide the added benefit of ensuring that the main coil remains centered and fixed in its position. Jung, [0141]. Such a modification would have further enhanced the securement of the third coil.

b. Expectation of Success

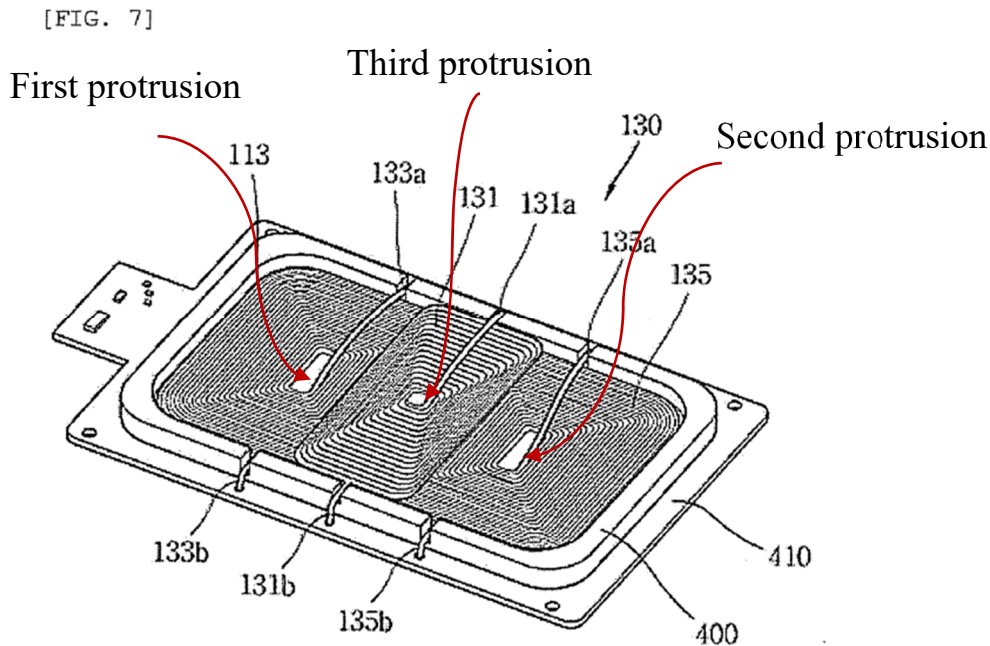
104. A POSITA would have had a reasonable expectation of success in configuring the third protrusion to be disposed in an inner circumference of the main coil, because the modification would have only required the use of known parts (protruding substrate) in accordance with their known functions. Jung, [0145]-[0146], [0174] (describing a third support 403c “corresponding to the hollow part of the central coil 111 and be[ing] formed at the center of the bottom surface of the concave part 401”); Tabata, FIGS. 2A-2D (illustrating a magnetic sheet of a non-contact charging station including a central convex portion (protrusion) 32 disposed in an inner surface of a transmission coil 21, and a stepped structure formed by recess 33 for receiving and retaining another portion of the transmission coil).

4. Claim 4: “The wireless power transmitting apparatus of claim 2, wherein a width of the third protrusion is less than a width of the first protrusion and a width of the second protrusion.”

105. Jung discloses or renders obvious the additional limitations of claim 4.

106. As explained for claim 3, Jung renders obvious a protrusion disposed in an inner circumference of the main coil.

107. A POSITA would have understood that the width of the third protrusion disposed in the inner circumference of the central coil, like the width of the first and second protrusions disposed in the inner circumference of the second and third coils, is limited by the width of the inner circumference of the central coil because it needs to fit securely within the coil to fix it in a set position and the protrusions “have shapes corresponding to those of inner circumferential surfaces of the hollow parts” of the coils. Jung, [0140]-[0141], FIGS. 6-7; Jung 719, [0065] (also disclosing transmission coil supports “formed to correspond to the shapes of inner peripherals of the hollow portions of the coils 112 and 113”). The width of the inner circumference of the central coil, as seen in Figure 7, is smaller than the width of the inner circumference of the first and second coils and their corresponding protrusions; thus, a POSITA would have also understood that a width of the third protrusion is smaller than a width of the first and second protrusions. Jung, FIGS. 6-7, 12 (illustrating a width of a protrusion 403c configured to fix the position of the main coil).



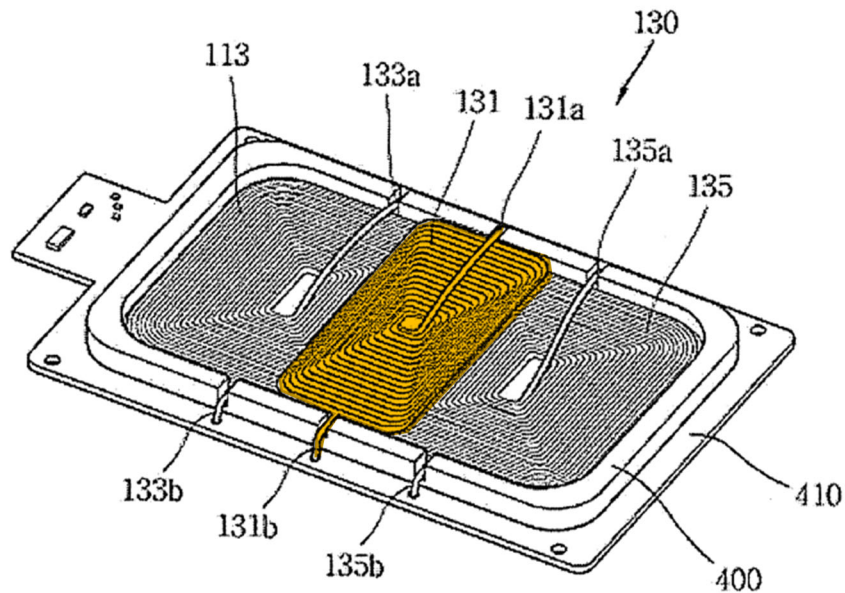
Jung, FIG. 7 (annotated).

5. **Claim 5: “The wireless power transmitting apparatus of claim 1, wherein terminals of the third transmitting coil are disposed between the first transmitting coil and the second transmitting coil.”**

108. Jung discloses the additional limitations of claim 5.

109. Jung further discloses that the central (third) transmitting coil includes end portions (131a, 131b), i.e., terminals, “connected to circuit patterns (not shown) formed on a lower surface of the circuit board 410.” Jung, [0132], [0143], FIGS. 6-7. The end portions 131a and 131b of the central coil are disposed between the first and second side (transmission coils), as illustrated in Figure 7. Jung, [0142], [0143], FIG. 7.

[FIG. 7]



Jung, FIG. 7 (annotated).

6. Claim 6: “The wireless power transmitting apparatus of claim 1, wherein the substrate is a soft magnetic substrate.”

110. Jung and Sakuma render obvious the additional limitations of claim 6.

111. As explained for [1d], Jung’s core (substrate) is “made of a magnetic material.” Jung, [0127]. Jung does not expressly disclose that the magnetic substance is soft, but Sakuma further renders obvious this feature.

112. As discussed for [1i], Sakuma teaches a “power transmitter” including a “soft magnetic sheet” 21, i.e., substrate, including multiple “soft magnetic pieces” 311 protruding from a surface of the substrate. Sakuma, [0037]-[0039], FIGS. 2A, 4. Sakuma further teaches that the “soft magnetic” material may be, for

example, “Mn—Zn ferrite or Ni—Zn ferrite,” “sendust,” or “sendust flakes dispersed and arranged into [a] resin binder,” and “prevent[s] magnetic leakage.” Sakuma, [0041] (emphasis added). Sakuma’s materials are consistent with those disclosed in the ’685 patent. Ex. 1001, 2:20-21 (“The soft magnetic substrate may include a composite having a metal powder and a polymer resin.”).

a. Motivation to Combine

113. A POSITA would have found it obvious and been motivated to make the magnetic substrate of Jung a “soft magnetic” substrate to prevent magnetic leakage as taught by Sakuma and because it was well known to utilize soft magnetic materials in the formation of such substrates. Sakuma, [0037]-[0039]; Willemsen, [0001]-[0003], [0007] (describing an “inductive power transmission” electronic device having a base including a soft magnetic layer that “improve[s] the inductive coupling between the primary and secondary coil” disposed on the soft magnetic layer); Jung 535, [0036], [0065], [0068] (describing a “wireless power transmission device” having a magnetic core (substrate) including “at least one of amorphous ferrite, Mn—Zn (50:50 parts by weight), Ni—Fe (80:20 parts by weight), and fine-metal (Fe—Si—Cu—Nb),” and “configured to receive the plurality of power transmission coils”); Baarman, [0003]-[0007] (describing “common” “soft magnetic materials” for “manufacturing flux concentrators” and “suitable for use with a wireless power transfer system”).

b. Expectation of Success

114. A POSITA would have had a reasonable expectation of success in using a soft material because of its known suitability for use in wireless power transmitting applications and because such a modification would have required no more than combining known technologies with predictable results. Indeed, it was well known in the art to form substrates from soft magnetic material “for use with a wireless power transfer system.” Baarman, [0006]-[0007]; Jung 535, [0036], [0065], [0068] (describing a “wireless power transmission device” having a magnetic core (substrate) including “at least one of amorphous ferrite, Mn—Zn (50:50 parts by weight), Ni—Fe (80:20 parts by weight), and fine-metal (Fe—Si—Cu—Nb),” and “configured to receive the plurality of power transmission coils”). It was also known to use such materials to “improve the inductive coupling between the primary and secondary coil,” and to “prevent magnetic leakage.” Willemsen, [0001]-[0003], [0007]; Sakuma, [0037]-[0039], [0041].

7. Independent Claim 7

115. Claim 7 is similar to claim 1 except it does not recite “a wall to surround a part of an outer circumference of the first transmitting coil and a part of an outer circumference of the second transmitting coil,” as recited in [1e]. Claim 7 is obvious over Jung for the reasons discussed in claim 1.

a. **[7Preamble] “A wireless power transmitting apparatus, comprising:”**

116. Jung discloses [7Preamble] for the same reasons discussed for [1Preamble].

b. **[7a] “a first transmitting coil;”**

117. Jung discloses [7a], for the same reasons discussed for [1a].

c. **[7b] “a second transmitting coil;”**

118. Jung discloses [7b], for the same reasons discussed for [1b].

d. **[7c] “a third transmitting coil on the first transmitting coil and the second transmitting coil;”**

119. Jung discloses [7c], for the same reasons discussed for [1c].

e. **[7d] “and a substrate to accommodate the first transmitting coil, the second transmitting coil, and the third transmitting coil, wherein the substrate comprises:”**

120. Jung discloses [7d], for the same reasons discussed for [1d].

f. **[7e] “a first protrusion inside an inner circumference of the first transmitting coil;”**

121. Jung discloses [7e], for the same reasons discussed for [1f].

g. **[7f] “and a second protrusion inside an inner circumference of the second transmitting coil,”**

122. Jung discloses [7f], for the same reasons discussed for [1g].

h. **[7g] “wherein the third transmitting coil is disposed between the first protrusion and the second protrusion,”**

123. Jung discloses [7g], for the same reasons discussed for [1h].

- i. **[7h] “wherein the first protrusion comprises a first stepped portion to support the third transmitting coil, and wherein the second protrusion comprises a second stepped portion to support the third transmitting coil.”**

124. Jung and Sakuma render obvious [7h], for the same reasons discussed for [1i].

8. **Claim 8: “The wireless power transmitting apparatus of claim 7, wherein the substrate comprises a third protrusion disposed between the first transmitting coil and the second transmitting coil.”**

125. Jung discloses the additional limitations of claim 8, for the same reasons discussed for claim 2.

9. **Claim 9: “The wireless power transmitting apparatus of claim 8, wherein the third protrusion is disposed in an inner circumference of the third transmitting coil.”**

126. Jung discloses or renders obvious the additional limitations of claim 9, for the same reasons discussed for claim 3.

10. **Claim 10: “The wireless power transmitting apparatus of claim 8, wherein a width of the third protrusion is less than a width of the first protrusion and a width of the second protrusion.”**

127. Jung discloses or renders obvious the additional limitations of claim 10 for the same reasons discussed for claim 4.

- 11. Claim 11: “The wireless power transmitting apparatus of claim 7, wherein terminals of the third transmitting coil are disposed between the first transmitting coil and the second transmitting coil.”**

128. Jung discloses the additional limitations of claim 11 for the same reasons discussed for claim 5.

- 12. Claim 12: “The wireless power transmitting apparatus of claim 7, wherein the substrate is a soft magnetic substrate.”**

129. Jung and Sakuma render obvious the additional limitations of claim 12 for the same reasons discussed for claim 6.

13. Independent claim 13

130. Claim 13 is similar to claim 1, except it does not recite “a wall to surround a part of an outer circumference of the first transmitting coil and a part of an outer circumference of the second transmitting coil,” as recited in [1e], or that “the third transmitting coil is disposed between the first protrusion and the second protrusion,” as recited in [1h]. Jung and Sakuma render obvious claim 13 for the reasons discussed in claim 1.

- a. [13Preamble] “A wireless power transmitting apparatus, comprising:”**

131. Jung discloses [13preamble], for the same reasons discussed for [1preamble].

- b. [13a] “a first transmitting coil;”**

132. Jung discloses [13a], for the same reasons discussed for [1a].

c. **[13b] “a second transmitting coil;”**

133. Jung discloses [13b], for the same reasons discussed for [1b].

d. **[13c] “a third transmitting coil on the first transmitting coil and the second transmitting coil;”**

134. Jung discloses [13c], for the same reasons discussed for [1c].

e. **[13d] “and a substrate to accommodate the first transmitting coil, the second transmitting coil, and the third transmitting coil, wherein the substrate comprises:”**

135. Jung discloses [13d], for the same reasons discussed for [1d].

f. **[13e] “a first protrusion inside an inner circumference of the first transmitting coil;”**

136. Jung discloses [13e], for the same reasons discussed for [1f].

g. **[13f] “and a second protrusion inside an inner circumference of the second transmitting coil,”**

137. Jung discloses [13f], for the same reasons discussed for [1g].

h. **[13g] “wherein the first protrusion comprises a first stepped portion to support the third transmitting coil, and wherein the second protrusion comprises a second stepped portion to support the third transmitting coil.”**

138. Jung and Sakuma render obvious [13g], for the same reasons discussed for [1i].

- 14. Claim 14: “The wireless power transmitting apparatus of claim 13, wherein the substrate comprises a third protrusion disposed between the first transmitting coil and the second transmitting coil.”**

139. Jung discloses the additional limitations of claim 14 for the same reasons discussed for claim 2.

- 15. Claim 15: “The wireless power transmitting apparatus of claim 14, wherein the third protrusion is disposed in an inner circumference of the third transmitting coil.”**

140. Jung discloses or renders obvious the additional limitations of claim 15 for the same reasons discussed for claim 3.

- 16. Claim 16: “The wireless power transmitting apparatus of claim 14, wherein a width of the third protrusion is less than a width of the first protrusion and a width of the second protrusion.”**

141. Jung discloses or renders obvious the additional limitations of claim 16 for the same reasons discussed for claim 4.

- 17. Claim 17: “The wireless power transmitting apparatus of claim 13, wherein terminals of the third transmitting coil are disposed between the first transmitting coil and the second transmitting coil.”**

142. Jung discloses the additional limitations of claim 17 for the same reasons discussed for claim 5.

18. Claim 18: “The wireless power transmitting apparatus of claim 13, wherein the substrate is a soft magnetic substrate.”

143. Jung and Sakuma render obvious the additional limitations of claim 18 for the same reasons discussed for claim 6.

B. Ground 2: Claims 6, 12, and 18 are Obvious over Jung, Sakuma, and Kurs

1. Claim 6: “The wireless power transmitting apparatus of claim 1, wherein the substrate is a soft magnetic substrate.”

144. To the extent Patent Owner argues that Sakuma does not render obvious a soft magnetic substrate because claim 6 requires a flexible or otherwise elastic magnetic substrate, claim 6 is further obvious over Kurs.

145. Kurs teaches a “resonator coil structure for wireless energy transfer.” Kurs, claim 1, [0018]. The structure includes an inductive element such as a coil, “a (gapped or ungapped) core made of magnetic material,” i.e., a substrate, and an “external circuit (e.g. a driving circuit)” for “delivering power to the inductive element,” which in turn “deliver[s] power to the external circuit (e.g. a driven load).” Kurs, [0247], [0335]-[0336]. Kurs further teaches that “it may be preferable to use a flexible form of magnetic material which may prevent or reduce vibration or shock transfer between resonators.” Kurs, [0808].

a. Motivation to Combine

146. Kurs, like the '685 patent, uses a soft magnetic material to provide flexibility and “prevent or reduce vibration or shock transfer.” Kurs, [0808]; Ex. 1001, 10:1-4 (“Further, by improving elasticity and shock resistance of a soft magnetic substrate on which a transmitting coil is disposed, a breakage phenomenon of the soft magnetic substrate can be reduced.”). In my opinion, a POSITA would have found it obvious and been motivated to make the magnetic substrate of Jung a *soft* magnetic substrate to “prevent or reduce vibration or shock transfer,” as taught by Kurs. Kurs, [0808].

b. Expectation of Success

147. A POSITA would have had a reasonable expectation of success in using a soft material because of its known suitability for use in wireless power transmitting applications and because such a modification would have required no more than combining known technologies with predictable results. Indeed, it was well known in the art to form substrates from soft (flexible) magnetic material to “enhance the desired magnetic, thermal, or mechanical properties,” (Baarman, [0082]), for wireless charging applications. Kurs, [0529]-[0547] (describing numerous wireless power transmitting applications benefiting from the instant disclosure); Partovi, [0209] (explaining that “[m]any materials that are typically used in transformer cores include materials described above, soft iron, Silicon

steel, laminated materials (to reduce eddy currents), Silicon alloyed materials, Carbonyl iron, Ferrites, Vitreous metals, alloys of Ni, Mn, Zn, Fe, Co, Gd, and Dy, nano materials, and many other materials in solid or flexible polymer” (emphases added)); An, [0049], [0059] (describing a “wireless power receiver” including a magnetic substrate and a coil unit wherein “[t]he magnetic substrate 100 may be prepared in the form of a sheet and may have a flexible property”).

2. Claim 12: “The wireless power transmitting apparatus of claim 7, wherein the substrate is a soft magnetic substrate.”

148. Jung, Sakuma, and Kurs render obvious the additional limitations of claim 12 for the same reasons discussed for claim 6.

3. Claim 18: “The wireless power transmitting apparatus of claim 13, wherein the substrate is a soft magnetic substrate.”

149. Jung, Sakuma, and Kurs render obvious the additional limitations of claim 18 for the same reasons discussed for claim 6.

XII. CONCLUSION

150. For the reasons set forth in Section XI, it is my opinion that one skilled in the art would have found claims 1-18 of the '685 patent obvious.

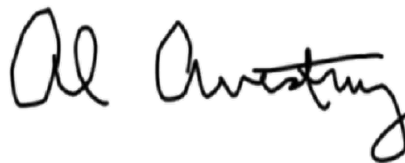
151. In signing this declaration, I understand that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross-examination in this case and that cross-examination will take place

within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

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

Date: June 29, 2023

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Al Avestruz". The signature is written in a cursive, flowing style.

Al-Thaddeus Avestruz, PhD