

VIII. GROUND I: ~~Claims~~ CLAIMS 1-7, 25-31 ~~are~~ ARE RENDERED ~~obvious-~~ obvious- by Wen alone or in view of Poilasne OBVIOUS BY WEN ALONE OR IN VIEW OF POILASNE

~~58. In my opinion,~~ Wen discloses a multiband antenna coupled to a plurality of transceivers and passively tuned. Poilasne discloses an antenna with multiple elements, *e.g.*, in a multiple-input multiple-output (MIMO) antenna design, which is an antenna array, and control elements for tuning the antenna. As detailed below, ~~in my opinion,~~ a POSITA would have been motivated to modify Wen to use antenna arrays and control elements as taught by Poilasne.

A. Wen (EX1004)

~~59. The cover page of~~ European Pat. No. 1,914,835 (“Wen”) ~~indicates it~~ was filed on October 20, 2006, and was first published on April 23, 2008. ~~I am informed that it~~ It is prior art ~~to the ‘358 Patent~~ under at least pre-AIA 35 U.S.C. § 102(a).

~~60. In general,~~ Wen discloses a mobile wireless communications device with multiple wireless RF transceivers that can “use [a] common antenna at a same time.” EX1004, [0027]. The common antenna has “a plurality of spaced apart signal feed points” to be coupled with “a plurality of wireless radio frequency (RF) transceivers” each having “a respective different operating frequency.” *Id.*,

[0027]. For example, the common antenna may have a “plurality of leg portions” that are “selected to tune the desired operating frequencies” through their geometries, as shown in Figure 2 (reproduced and annotated below). *Id.*, [0028], [0035]. A controller is employed to “selectively operat[e] at least some of the wireless RF transceivers to advantageously use the common antenna at a same time.” *Id.*, [0027]

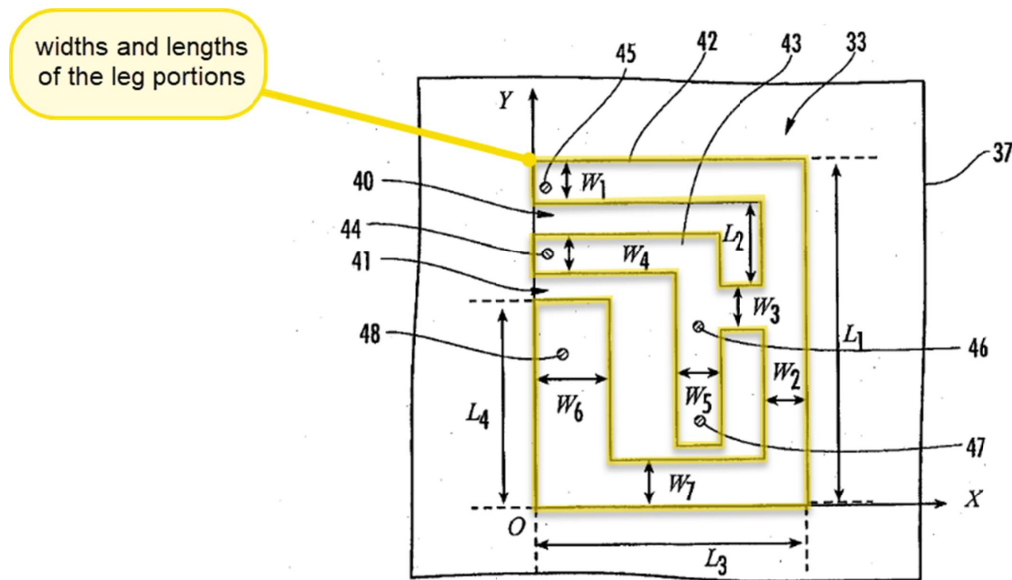
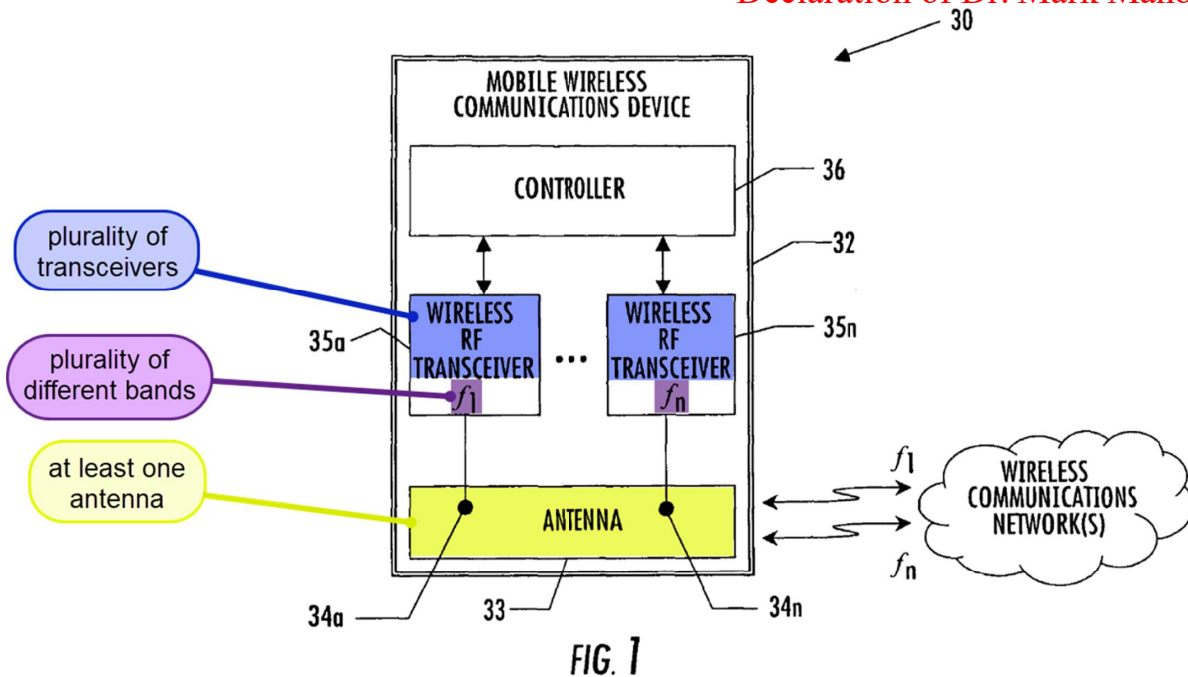


FIG. 2

~~61.~~ Wen’s Figure 1 illustrates one embodiment of a mobile wireless communications device with a multiband antenna.



B. Poilasne (EX1009)

~~62. The cover page of~~ U.S. Pat. Pub. No. 2004/0095280 (“Poilasne”) ~~indicates it~~ was filed on November 18, 2002, and was published May 20, 2004. ~~I am informed that it~~ It is prior art ~~to the ‘358 Patent under at least pre-AIA 35 U.S.C. § 102(b).~~

~~63. In general,~~ Poilasne ~~discloses~~ teaches a wireless communications device such as a cell phone with an antenna array, *i.e.*, “an antenna comprising multiple elements.” EX1009, [0042]. The antenna array may be configured in a “multiple input-multiple output [(MIMO)] antenna design” ~~that provides or to provide~~ “beam switching” and “beam steering” capabilities. *Id.* One or more “control elements” may be used to turn individual antennas in the array on or off, to “vary the

resonant frequency of the antenna,” or for “impedance matching of the antenna.”

Id., [0046], [0055], [0060], [0062]. Poilasne’s antenna

~~64. Poilasne’s antenna~~ array “is able to cover multiple frequency bands, either independently or at the same.” EX1009, [0038]. ~~In one embodiment the antenna is “a 3D antenna (79) comprised of multiple capacitively loaded magnetic dipole antennas” EX1009, [0067]. Such a multi-element antenna “effectuates coverage of multiple frequency bands and provides the most optimized solution in terms of input impedance, radiated power and beam direction.” *Id.*~~

C. Motivation to combine

~~65. In my opinion, a~~ POSITA would have been motivated to modify Wen to use an antenna array and control elements in view of Poilasne, and would have reasonably expected the combination to succeed. EX1003, ¶65.

~~66. First, I note that~~ Poilasne provides express motivations to utilize antenna arrays in wireless devices. ~~In particular,~~ EX1003, ¶66. Poilasne teaches that “new generations” of devices that are “smaller and embedded with more and more applications” will require “new antenna designs ... to provide solutions to inherent limitations of these devices.” EX1009, [0005]. “In multi-band applications” specifically, antennas “will need to take into account beam switching, beam steering, space or polarization antenna diversity, impedance matching, frequency switching, mode switching, etc., in order to reduce the size of

devices and improve their performance.” *Id.* ~~In my opinion, a POSITA would have known that at~~ At least some of these techniques, including beam switching, are typically implemented using antenna arrays. EX1003, ¶66.

~~antenna arrays.~~

~~67. I note that~~ Poilasne also discloses ~~unique advantages of its embodiments that comprise multiple~~ advantages unique to antenna ~~elements forming an antenna array~~ arrays. *Id.*, ¶67. For example, Poilasne explains that “one way to improve the transmission quality of an antenna is to switch an antenna’s beam direction or to steer an antenna’s beam.” ~~EX1009, [0060]. Poilasne teaches how to accomplish this~~

which Poilasne achieves using ~~two or more~~ an antenna ~~elements.~~ Id. array. EX1009, [0060]-[0066] (~~embodiments with~~ two elements), [0067] (~~embodiment with~~ more than two elements).

~~68.~~ Second, ~~I note that~~ Poilasne provides express motivations to utilize control elements to tune the antenna. ~~In particular,~~ EX1003, ¶68. Poilasne’s control elements ~~are necessary to implement Poilasne’s antenna array because they are used to~~ turn individual antennas on or off. EX1009, [0062]. However, ~~Poilasne teaches that the control elements~~ they can also advantageously be used to “vary the resonant frequency of the antenna” or to “control the input impedance of the antenna.” *Id.*, [0046], [[0051]. ~~In my opinion, both of these uses confer distinct advantages;~~ EX1003, ¶68. For example, varying the resonant frequency

~~of the antenna~~ enables real-time switching ~~between~~for regional frequency bands-
~~used in different regions~~, e.g., “switching from ... a 800/1900 MHz US band to a
900/1800 MHz GSM Europe and Asia band.” EX1004, [0037]. Similarly,
~~controlling the impedance of the antenna allows real-time adjustment of~~adjusting
“the input impedance
... ~~to~~ maintain[s] the best antenna characteristics while the antenna’s environment
is changing.” *Id.*, [0051].

~~69. In my opinion, it was also~~The use of tuners for antenna tuning and
impedance matching was well known in the art ~~to use components such as~~
~~tuners to perform tuning and impedance matching for an antenna.~~ EX1003,

¶69. For example,

U.S. Pat. No. 8,583,065 (“Ben-Bassat”), filed in June 2007, discloses that
“antenna tuning circuits are in *widespread use today*,” ~~and used to~~ “allow[] [an
antenna] to operate over a wide range of frequencies” and ~~adjust the impedance of~~
~~the antenna to~~ “minimize[] the SWR [standing wave ratio] and maximize[] power
transfer” through ~~the antenna system.~~impedance matching. EX1014, 1:51-2:9. ~~In~~
~~my opinion, a~~A POSITA would have also known that tuners are frequently used in
RF systems ~~to match the impedance at the antenna to the impedance of a~~
~~transmitter, receiver, or transmitter in order to achieve~~for impedance matching
with well-known benefits,

such as improving power transfer, minimizing distortion, and preventing overheating. EX1003, ¶69.

~~70. In addition, in my opinion,~~ Wen, Poilasne and the '358 Patent are all analogous art because they are directed to the same technological subject matter, multiband antenna systems for wireless devices. EX1001, Abstract (“wireless devices” with antennas “for transmission and reception of many different bands”); EX1004, Abstract (“mobile wireless communications device” with “a common antenna” and multiple “transceivers” with “respective different operating frequency”); EX1009, [0038] (“a configurable antenna ... that is able to cover multiple frequency bands”).

~~71. In my opinion, a~~ POSITA would have reasonably expected to be successful in modifying Wen based on Poilasne’s teachings. ~~In particular, it is my opinion that~~ EX1003, ¶71. Specifically, a POSITA would have understood that Poilasne’s teachings can be beneficially applied to Wen in one of two ways: first, by modifying Wen’s antenna to operate in an array (*e.g.*, using two or more instances of Wen’s antenna that that operate together as an array, and controlled by Poilasne’s control elements, similar to the multi-element antenna embodiments shown in Figures 9-11 of Poilasne); or second, by replacing Wen’s antennas with a multi-element antenna embodiment taught by Poilasne. ~~In my opinion,~~ *Id.* Poilasne describes these embodiments and their practical implementations in

sufficient detail to enable a POSITA to apply them to Wen using routine engineering skills that would be within the capacity of a POSITA. Id.

D. Claim 1

1. 1[pre]: A wireless device, comprising:

~~72. I understand that the preamble to a patent claim is generally not limiting. However, to~~ To the extent the preamble is limiting, ~~in my opinion~~ Wen discloses “a mobile wireless communications device.” EX1004, [0027]; *see also id.*, [0030], [0041], [0043] (same); EX1003, ¶72.

2. 1[a]: one or more antennas wherein at least one of said one or more antennas includes one or more elements or sub-elements, said one or more antennas forming an antenna array; and

~~73. In my opinion, it would have been obvious to a POSITA to use an~~ It would have been obvious to a POSITA to use an antenna array in Wen’s wireless device in view of Poilasne. EX1003, ¶¶73-80. As ~~I~~ discussed ~~above~~ in Section VIII.C ~~which I incorporate herein by reference, in my opinion,~~ a POSITA would have been motivated to use an antenna array based on the teachings of Poilasne. Further, a POSITA would have reasonably expected to be successful in applying Poilasne’s array teachings to Wen using either of two possible approaches:

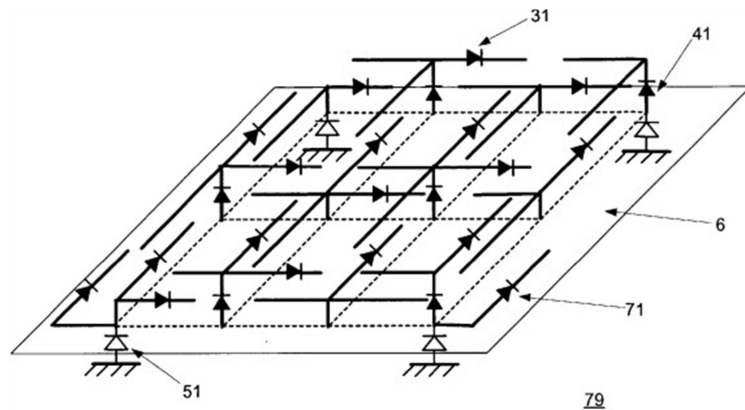
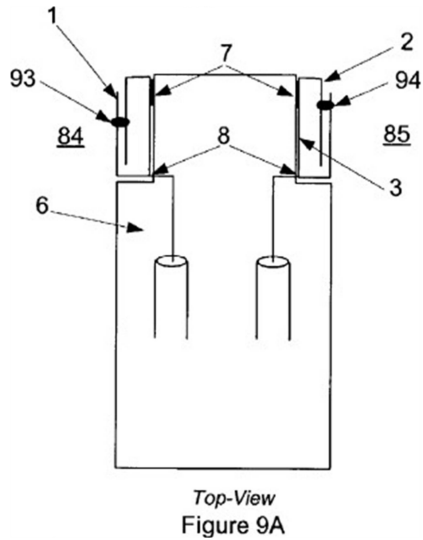
(1) forming an array comprising individual antennas according to Wen’s antenna design, or (2) replacing Wen’s antenna with an antenna array embodiment

taught by Poilasne and incorporating Poilasne's antenna design. *Id.*, ¶73.

~~74. First, I will address the Poilasne's antenna design. In particular,:~~

Poilasne discloses an antenna design comprising "a plurality of portions" (*i.e.*, ~~*sub-elements*~~*sub-elements*), such as a "capacitive area," an "inductive area," and a "feed area"; or a "top portion," "middle portion," and "bottom portion." EX1009, [0007]. To provide support for beam switching, MIMO, and antenna steering, ~~specifically,~~ Poilasne ~~discloses using~~uses a configuration of *two or more dipole antennas*

that "are switched ON or OFF using control elements." EX1009, [0060]; *see also id.*, [0042] (discussing beam switching and MIMO antenna design). For example, ~~in one embodiment,~~ two dipole antennas with respective control elements and feed points may form an antenna array, as illustrated in Figure 9A (reproduced below). *Id.*, [0062]-[0063]. ~~In another embodiment, Poilasne discloses~~Alternatively, a "3D antenna" ~~comprising~~may comprise multiple dipole antennas ~~that~~and "effectuates coverage of multiple frequency bands," as illustrated in Figure 11 (reproduced below). *Id.*, [0067].

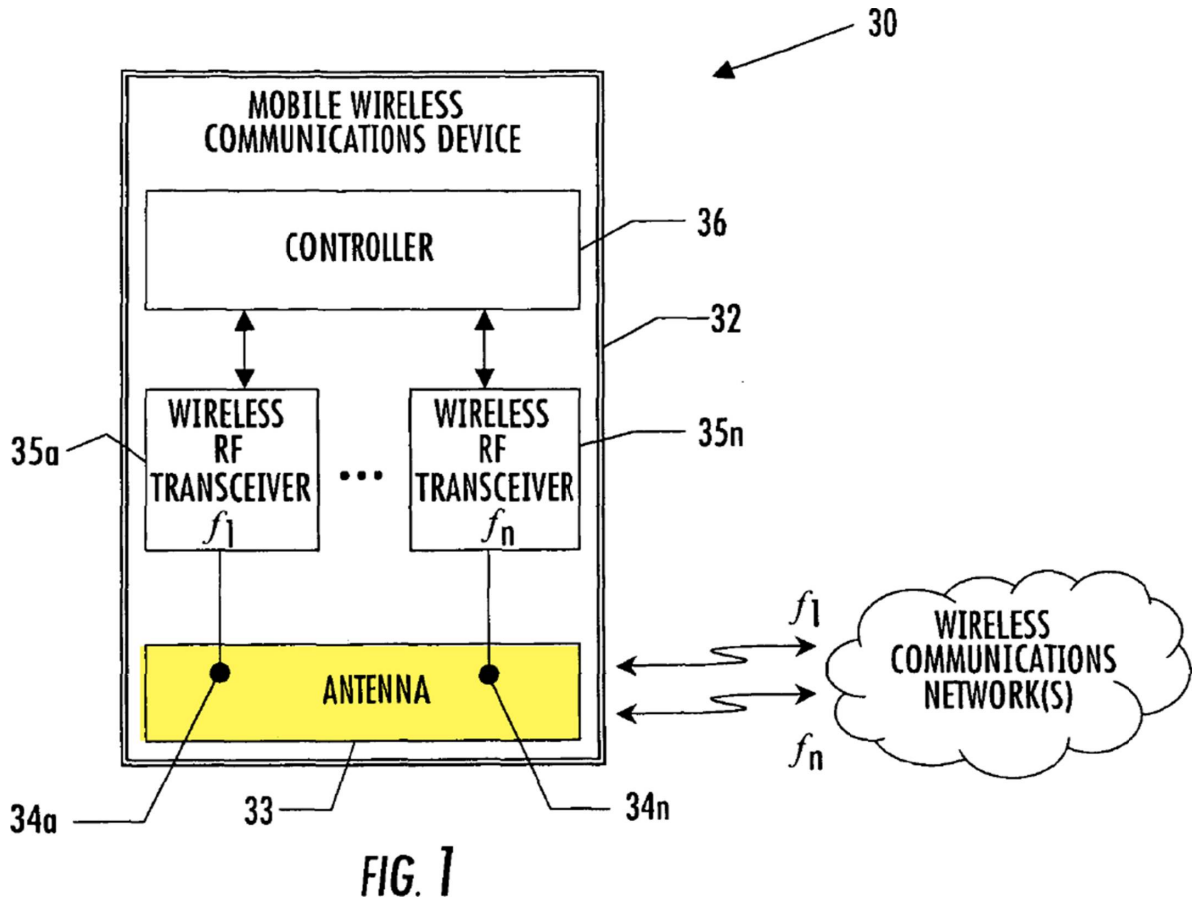


~~75.~~ Poilasne’s antennas form an array because they work together to provide beam switching, antenna steering, or MIMO capabilities. *Id.*, [0042], [0060]. ~~I note that PO applies the same understanding of~~ interprets the term “array” in ~~its infringement contentions~~ this way in the related district court case. EX1015, 3 (arguing that MIMO requires multiple antenna ~~elements~~ “configured and operated together as an” “array” and ~~more generally~~ that antenna elements that “operate together to provide

steerable, multi-band performance” are an “array”).

~~76. In my opinion, a~~A POSITA would have understood that Poilasne’s array of dipole antennas can ~~be used as~~replace the antenna in Wen’s system. ~~I note that~~ Wen expressly teaches that its multi-band antenna “may be a substantially linear antenna.” EX1004, [0033]. ~~In my opinion, a~~A dipole antenna is one type of linear antenna. EX1003, ¶76.

~~77. Next, I will address~~ **Wen’s antenna design**: Wen discloses a “common *antenna*” that is “shared by a plurality of wireless radio frequency (RF) transceivers 35a-35n.” EX1004, [0027], [0031]; *see also id.*, Fig. 1 (annotated~~, showing antenna as element 33 in yellow~~ below):



~~78.~~ Wen's antenna includes *multiple sub-elements*, e.g., "leg" portions that are used to "tune the desired operating frequencies of the antenna," each of which "may be substantially related to a given operating frequency band" or "multiple operating frequency bands." *Id.*, [0035]; see also *id.* Fig. 2 (showing leg portions in ~~an exemplary~~one embodiment):

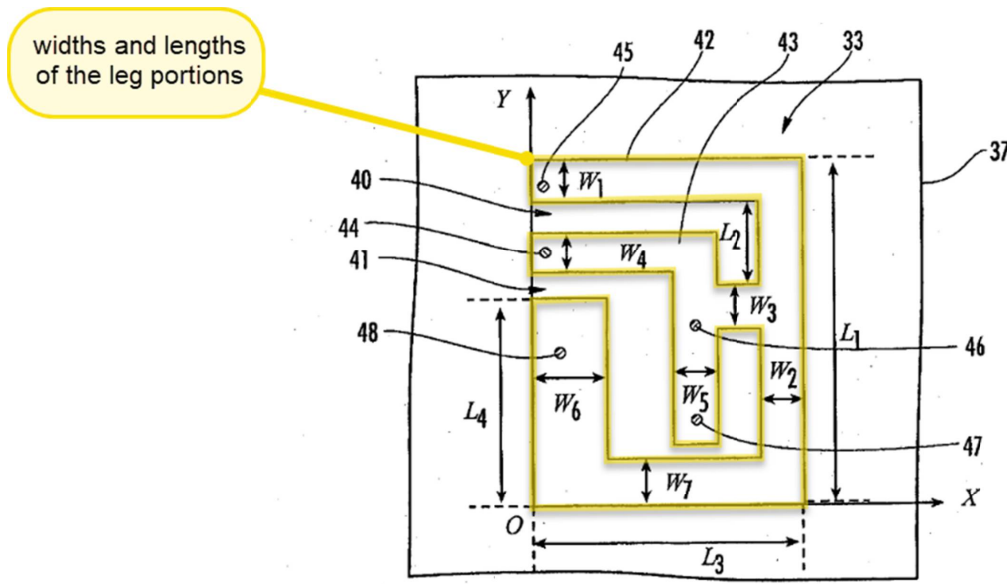


FIG. 2

79. As discussed above, Poilasne discloses an array of two or more dipole antennas that work together to provide beam switching, steering, or MIMO capabilities. EX1009, [0042], [0060]-[0062], [0067], Fig. 9A, Fig. 11. ~~In my~~ POSITA ~~opinion, a POSITA~~ would have understood that Wen's antenna design may be used for each of the antenna elements in Poilasne's array because Wen's antenna may be any "substantially linear antenna," e.g., a dipole antenna. EX1004, [0033]; EX1003, ¶78.

80. Accordingly, ~~in my opinion Wen alone or in view of Poilasne renders obvious Limitation 1[a] and a POSITA would have understood Wen alone or in view of Poilasne to render obvious Limitation 1[a].~~

3. 1[b]: a plurality of transmitters, receivers or transceivers that operate in one or more frequency bands;

~~81. In my opinion, Wen alone or in view of Poilasne renders obvious Limitation 1[b]. In particular,~~ Wen discloses “a *plurality* of wireless radio frequency (RF) *transceivers* carried by the housing and coupled to respective ones of the signal feed points of the common antenna,” which connect the antenna to other elements in the wireless device. EX1004, [0027]. ~~In my opinion,~~ Wen’s transceivers are also useable with Poilasne’s antenna design because Poilasne’s antennas ~~includes~~include feed points and/or feed areas. EX1003, ¶¶81-83. For example, Poilasne discloses that “[o]ne or more of the plurality of portions” (*i.e.*, antenna sub-elements) may define a feed area,” and the “wireless communication device is coupled to the antenna through the feed point.” EX1009, [0007]; *see also id.*, [0051]-[0052] (describing ~~antenna embodiments with~~ control elements coupled to an antenna feed point or feed area).

~~82.~~ Each of Wen’s “wireless RF transceiver[s] preferably has a *respective different operating frequency* associated therewith.” *Id.*, [0031]; *see also id.*, [0039] (~~example with~~ antenna “tuned to provide operation at 900 MHz, 1800 MHz, and 5 GHz via a selective connection of appropriate wireless RF transceivers”). ~~Thus, it is my opinion that each transceiver operates in at least one frequency band;~~ Fig. 1 (annotated below). Thus, both the individual transceivers and the plurality of transceivers operate in ~~multiple frequency bands~~ (at least one ~~per~~(i.e., one or more) frequency bands. EX1003, ¶82.

transceiver) (*i.e.*, ~~operate in one or more frequency bands~~). Wen's transceivers are illustrated in Figure 1, annotated below, where the plurality of transceivers are elements 35a-35n as annotated in blue and their corresponding frequencies of operation are f_1 - f_n as annotated in purple:

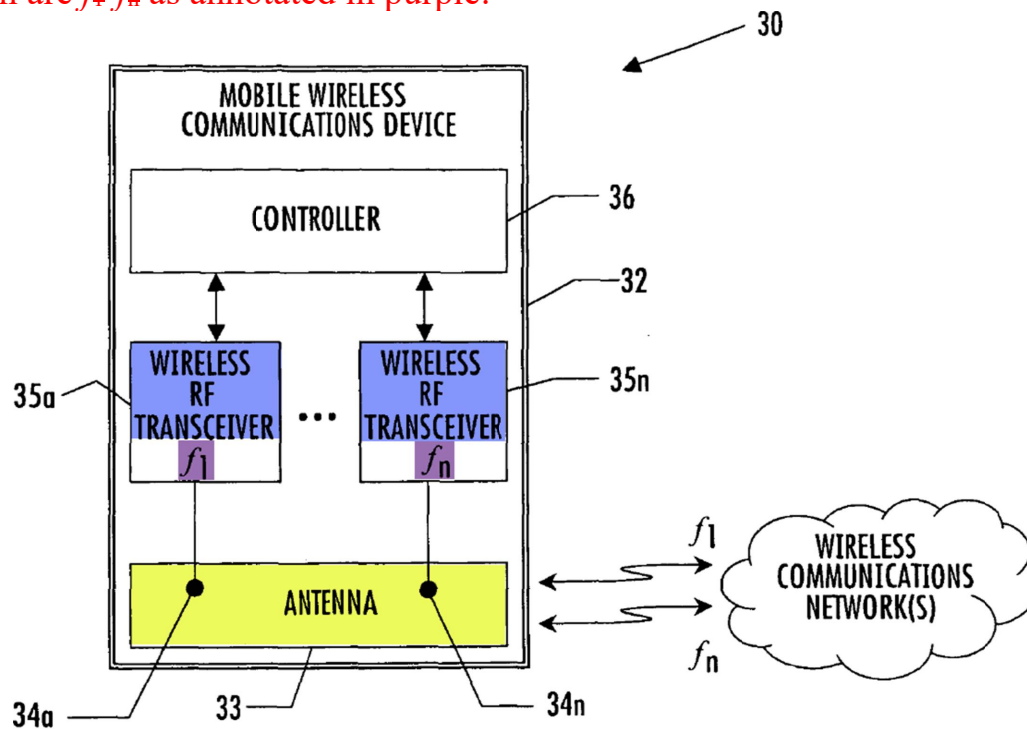


FIG. 1

83. Accordingly, in my opinion Wen alone or in view of Poilasne renders obvious Limitation 1[b] and a POSITA would have understood Wen in view of Poilasne to render obvious Limitation 1[b].

4. 1[c]: wherein at least one antenna of said antenna array is used by said plurality of transmitters, receivers or transceivers in a plurality of different bands,

84. In my opinion, Wen alone or in view of Poilasne renders obvious Limitation 1[c]. As I described above in connection with Limitation 1[b],

Wen discloses a *plurality of transceivers* ~~that operate~~ in a *plurality of different bands* ~~and that~~ connect to ~~antenna~~ feed points (e.g., ~~the feed points~~ on Wen's or

Poilasne's antennas). See [Limitation 1\[b\]](#); *see also* EX1004, [0029] (example with “~~different~~ operating frequencies ... within a range of about 900 MHz to 6 GHz”); [EX1003, ¶84](#).

~~85. As I described above in connection with Limitation 1[a], when~~ [When](#) Wen's antenna design is used in Poilasne's array, [see 1\[a\]](#), Wen discloses the antenna (e.g., antenna 33) *is used by* the plurality of transceivers ~~in a plurality of different bands~~ (e.g., transceivers 35a-35n operating in bands f_1 to f_n). EX1004, [0031], Fig. 1. ~~As shown in Figure 1 that is reproduced and annotated above,~~ [\(showing](#) the antenna ~~is~~ connected to and used by the ~~plurality of~~ transceivers). ~~I note that~~ Wen [also](#) expressly discloses

that “[t]he antenna 33 ... is *shared* by a *plurality of wireless radio frequency (RF) transceivers 35a-35n* ~~(e.g., cellular and/or wireless LAN transceivers)~~” and that “[e]ach wireless RF transceiver preferably has a respective *different operating frequency associated therewith*.” EX1004, [0031]; *see also id.*, [0039] (example ~~where the antenna “provide~~ [with transceivers “provid\[sing\]](#) operation at 900 MHz, 1800 MHz, and 5 GHz ~~via a selective connection of appropriate wireless RF transceivers 35~~”); [0036] (“[A] single multi-feed antenna [] may be used instead of a plurality of different antennas ... to provide ~~multi-frequency~~ [multi-frequency](#) band operation.”). Accordingly, the shared antenna is used in *a plurality of different bands*, i.e., at least one ~~band~~ for each ~~of the~~

~~plurality of transceivers.~~ transceiver. EX1003, ¶85.

~~86. As I described above in connection with Limitation 1[a], when~~ When
Poilasne’s antenna design is used, see 1[a], Poilasne discloses that its antenna is
“able to cover multiple frequency bands, either independently or at the same
time.” EX1009, [0038]; *see also id.*, [0067] (3D antenna embodiment that
“effectuates coverage of multiple frequency bands”). Wen’s plurality of
transceivers are “coupled to respective ones of the signal feed points of the
common antenna,” EX1004, [0027], and ~~thus~~ would be coupled to the feed points
and/or feed areas of ~~at least one of~~ Poilasne’s antennas in the combined system
~~and used in a plurality of different bands. EX1004, [0027].~~ EX1003, ¶86.

~~87. Accordingly, in my opinion Wen alone or in view of Poilasne
renders obvious Limitation 1[c] and a POSITA would have understood Wen
in view of Poilasne to render obvious Limitation 1[c].~~

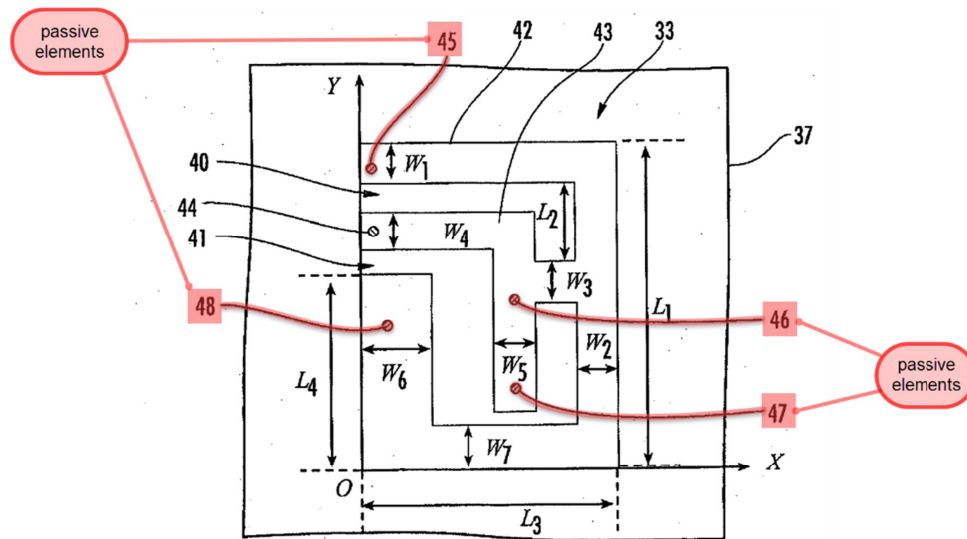
5. **1[d]: wherein said at least one antenna is one or more of,
a) an actively tuned antenna, and b) is tuned by one or
more passive elements which are selected or interconnected
using electronic control.**

~~88. In my opinion, Wen alone or in view of Poilasne renders obvious
Limitation 1[d].~~ Both Wen and Poilasne disclose their respective antenna designs
use at least one of prong (a) and (b) of the limitation, and thus meet this limitation.
See EX1015, 13 (alleging infringement based on “part (b) of this claim element”).

~~89. Regarding Wen’s antenna design, in my opinion,~~ Wen discloses

at least prong (b) because Wen's antenna is tuned by one or more passive elements which are selected or interconnected using electronic control. ~~In particular, Wen~~

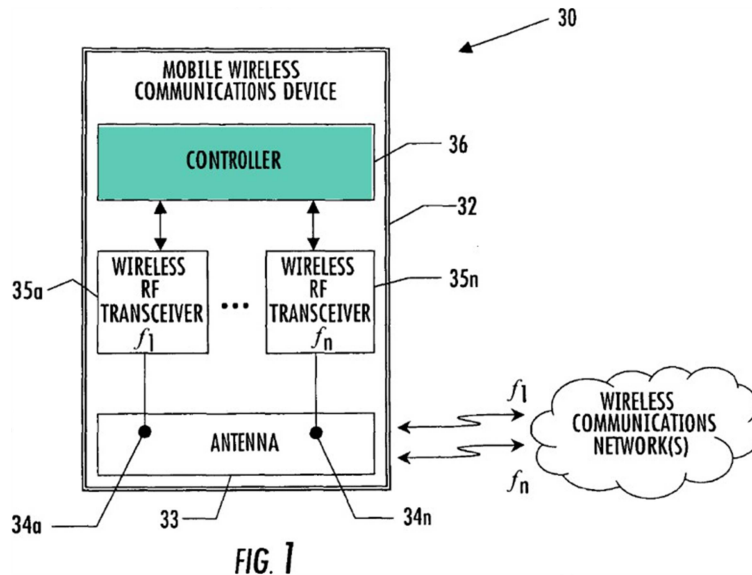
EX1003, ¶¶89-91. Wen's ~~discloses passive elements in the form of~~ are "leg portions" that make up the antenna and "may advantageously *be selected to tune* the desired operating frequencies of the antenna 33." EX1004, [0035]; see also id., Fig. 2 (annotated below). Each leg portion "may be substantially related to a given operating frequency band" or "may influence multiple operating frequency bands." *Id.* ~~In my opinion, a POSITA would have understood the~~ The leg portions are passive elements because they have fixed electrical characteristics, *e.g.*, they may be implemented as "conductive trace[s] on [a] dielectric substrate," and do not include any additional circuitry that changes their electrical characteristics during operation. EX1004, [0032]. ~~The "plurality of leg portions" are illustrated in Figure 2, reproduced and annotated below. Id., [0035], Fig. 2.; EX1003, ¶89.~~



~~90.~~ Wen further discloses a controller 36 (i.e., *electronic control*) that “*selectively operat[es]*” at least some of the wireless RF transceivers to ... use the common antenna at a same time.” *Id.*, [0027]. Specifically, the antenna is “*tuned* to provide operation at” specific frequency bands “via a *selective connection* of appropriate wireless RF transceivers” to different “feed point[s]” on different leg portions of the antenna. EX1004, [0039]-[0040]; *see also id.*, [0034] (describing the structure of the feed points). ~~In other words, Wen’s, Fig. 1 (annotated below). When the controller tunes the antenna by selecting~~ selects a specific transceivers to provide a signal transceiver connected to a specific feed point ~~on a leg portion, thereby selecting, it effectively selects~~ the corresponding leg portion and ~~tuning~~ tunes the antenna to its associated operating frequency or

frequencies. ~~The controller is illustrated in Figure 1 as annotated below:~~ EX1003,

¶90.



~~91. In my opinion, a~~ POSITA would have also understood that by selectively operating different transceivers to “tune the desired operating frequencies of the antenna,” Wen’s controller *actively* tunes the antenna. EX1004, [0035]; EX1003, ¶91. Specifically,

the controller *actively* “operates at least some (i.e., two or more) of the wireless RF transceivers 35a-35n to advantageously use the common antenna 33 at a same time.” EX1004, [0031]. ~~In my opinion, a~~ POSITA would have understood that the selective operation of particular transceivers is accomplished using active circuit elements, such as switches. EX1003, ¶91. At a minimum, ~~it is my opinion that~~ it would have been obvious to a POSITA to use standard active circuit elements, which a POSITA would have been familiar with and would have been

capable of incorporating into Wen's system, to select between different transceivers and leg portions in Wen's system. *Id.*

~~92. Regarding Poilasne's antenna design;~~ Poilasne discloses both prong (a) and prong (b). ~~In particular,~~ EX1003, ¶¶92-94. Poilasne's antenna comprises a "a plurality of portions," such as a "capacitive area," an "inductive area," and a "feed area"; or a "top portion," "middle portion," and "bottom portion." EX1009, [0007]. At least some of these portions are *passive elements* because they are implemented as "conductors" with predetermined lengths and fixed electrical characteristics. *Id.*, [0008], [0044]; EX1003, ¶92. Poilasne also discloses at least one "active control element" that is "electrically coupled to one or more of the portions." EX1009, [0007].

~~93.~~ The control element may "exhibit active capacitive or inductive characteristics," and "the capacitance of the control element ... may be actively changed ... to vary the resonant frequency of the antenna" (*i.e.*, an *actively tuned antenna*). *Id.*, [0007], [0046]; see also EX1003, ¶93. The control element may also

operate as a "switch" that "electrically couples or decouples" two portions of the antenna, changing the effective length of the antenna "to actively change the resonant frequency of the antenna" (*i.e.*, *tuning the antenna by interconnecting passive elements using electronic control*). *Id.*, [0047]; *see also id.*, [0007] (disclosing control element "coupled to" two portions of the antenna and

“compris[ing] a switch”); EX1003, ¶93.

~~94. Accordingly, in my opinion Wen alone or in view of Poilasne renders obvious Limitation 1[d] and a POSITA would have understood Wen in view of Poilasne to render obvious Limitation 1[d]. As such, in my opinion Wen in view of Poilasne discloses and renders obvious the entirety of claim 1, and a POSITA would have understood Wen in view of Poilasne to disclose and render obvious the entirety of claim 1.~~

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