Mills, Donald

From:	Steve Shatil <steves@department13.com>
Sent:	Tuesday, October 6, 2020 4:30 PM
To:	Mills, Donald
Subject:	Agenda for 16194290 (SA-000.C5) 10-07-2020
Attachments:	Agenda for SA-000.C5 Interview.pdf; PTOL413A.pdf; sb0439.pdf

Dear Examiner,

In preparation for our phone interview on 10/07/2020, attachments to this email include: 1. An agenda, 2. sb0439, and 3. PTOL413A.

Sincerely,

Steven J Shattil
Reg. No. 40170

Agenda for Examiner Interview regarding Appl. No. 16/194,290 on 10/07/2020

1. **Issue no. 1**: The Office disagreed with Applicant's assertion that the application should be examined under Pre-AIA:

   The Office stated that 11187107 and 10145854 fail to provide adequate support for the DFT matrix recited in claims 1, 9, and 17. As shown below, Applicant believes that both '854 and '107 applications provide sufficient support to comply with the requirements of the first paragraph of pre-AIA 35 U.S.C. 112, so the claims should have the priority benefit of the '854 application. If the Office still disagrees, Applicant would like the Office to suggest how the recitation of "DFT matrix" may be clarified.
2. **Issue no. 2**: The Office disagreed with Applicant's assertion that Ahn should not be considered prior art:

   The Office stated that the claimed DFT matrix must be adequately supported and enabled in order to receive the argued priority. As shown below, Applicant believes that 11187107 and 10145854 provide adequate support for the DFT matrix recited in claims 1, 9, and 17.

A person of ordinary skill in the art would understand "DFT matrix" from CRC Standard Mathematical Tables and Formulae, 30th Edition (1996 CRC Press LLC), Page 543:

"**6.23 DISCRETE FOURIER TRANSFORM (DFT)**

The discrete Fourier transform of the sequence $\{a_n\}_{n=0}^{N-1}$, where $N \geq 1$, is a sequence $\{A_m\}_{n=0}^{N-1}$, defined by

$$A_m = \sum_{n=0}^{N-1} a_n (W_N)^{mn}, \text{for } m = 0, 1, \ldots, N-1$$

where $W_N = e^{i2\pi/N}$."

The above equation is often expressed as a matrix-vector product wherein the sequence $\{A_m\}_{n=0}^{N-1}$ is an NX1 vector, which equals the NX1 vector representing the sequence $\{a_n\}_{n=0}^{N-1}$ multiplied by the *NXN* DFT matrix having elements $(W_N)^{mn}$. For example, in https://en.wikipedia.org/wiki/DFT_matrix,

> "An *N*-point DFT is expressed as the multiplication X = Wx, where x is the original input signal, W is the ***N*-by-*N*** square **DFT matrix**, and X is the DFT of the signal."

The '854 application discloses each "polyphase spreading sequence", or CI code, having elements which are $(W_N)^{mn}$, such as:

> Par. [0146]: "Orthogonality between CI signals can be understood as an appropriate time separation $\tau \in \{k/f_s, k = 1, 2, \ldots, N\text{-}1\}$ between superposition signals, or as carriers of each carrier set coded with a different **polyphase spreading sequence**:
>
> $$f(\phi) = \{e^{j\theta 1}, e^{j\theta 2}, \ldots, e^{j\theta N}\} = \{e^{j0}, e^{j2\pi k/N}, \ldots, e^{j(N-1)\cdot 2\pi k/N}\}$$
>
> with respect to values of $k=0, 1, \ldots, N\text{-}1$."
>
> Par. [0168]: "The basic family of CI codes is generated from an ***M*x*M* matrix of elements** having phases ϕ_{mn} described by:
>
> $$\phi_{mn} = 2\pi mn/M + 2\pi f_o m/f_s M,$$
>
> where ***m* and *n* are row and column indices, respectively**. *M* may have any positive integer value. The second term in ϕ_{mn} is an optional phase shift applied to all terms in a row. The phase-shift ϕ_{mn} may correspond to a carrier frequency offset f_o and a sub-carrier separation f_s. A basic CI code c_m of length *N* can include a **row or column vector** consisting of terms:
>
> $$c_m = e^{im\phi'} \sum_{n=0}^{N-1} e^{imn\phi} \hat{n}$$
>
> where $\phi = 2\pi/M$ and $\phi' = 2\pi f_o/f_s M$."

'854 explicitly states:

> Par. [0189]: "CI symbols may be values derived from at least one invertible transform function, such as a **Fourier transform**."

which is shown above as a DFT.

Furthermore, FIG. 7 in '854 shows a DFT matrix and depicts the mathematical operation:

$$A_m = \sum_{n=0}^{N-1} a_n (W_N)^{mn}, \text{for } m = 0, 1, \ldots, N-1$$

in which A_m are CI symbol values w_n, and a_n are data symbols s_n.

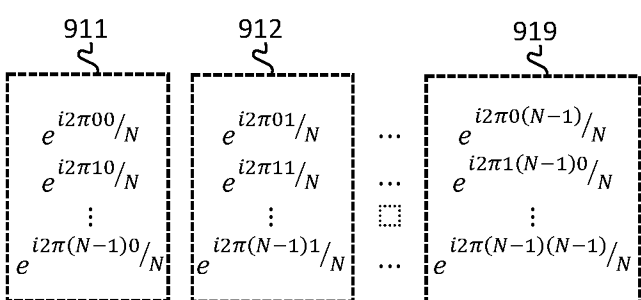
The '107 application claims priority to '854 and further includes the following:

> Par. [0172]: "Preferred embodiment of the invention may employ **Spread-OFDM**, which involves multiplying each data block s(n) by a **spreading matrix A**:
>
> u(n)=As(n)
>
> In the case where **CI spreading codes** are employed, A_{nm} = **exp(-*j2πnm/N*).** This maps the data symbols to pulse waveforms positioned orthogonally in time. This choice of spreading codes also gives the appearance of reversing the IFFT. However, the resulting set of pulse waveforms is a block, rather than a sequence, wherein each waveform represents a cyclic shift within the block duration T_s, such as described in U.S. Pat. Appl. Pubs. **20030147655** and **20040086027**, which are both incorporated by reference."

In 20030147655, a k^{th} spreading code is expressed in Par. [0091]:

$$c_k(t)=\{1, e^{i2\pi k/N}, \ldots, e^{i2\pi k(N-1)/N}\}$$

"CI code" mentioned in [0186] is depicted mathematically as codes 911, 912,..., 919 in FIG. 9A:



Par. 0159 states,

> "Complex sub-carrier weights may be generated from a product of a vector or matrix of data symbols with a vector or **matrix of phase space (i.e., CI code) values**."

In 20040086027, FIG. 5B illustrates a method for generating sub-carrier weights from a set of data symbols and a CI code matrix (Par. 0067), and Par. 0145 states:

> "Since rows and columns of the basic **CI code matrix** resemble the vectors of complex values used in **DFTs**, the sub-carrier weights w_1 to w_N can be calculated using a fast transform algorithm."

Furthermore, '854 and '107 contain detailed descriptions of the properties of DFT matrix values $(W_N)^{mn}$ when they are employed as CI codes (such as orthogonality, which comes from the expression $\sum_{m=0}^{N-1}(W_N)^{m(k-n)} = N\delta_{kn}$ on page 543 of CRC Standard Mathematical Tables and Formulae), and how such codes shape the superposition of OFDM subcarriers.