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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte WEI AN, BRIAN REGGIANNINI, and
RICHARD P. SCHUBERT

Appeal 2016-002542
Application 13/764,076
Technology Center 2600

Before JASON V. MORGAN, LINZY T. McCARTNEY, and
KAMRAN JIVANI, *Administrative Patent Judges*.

MORGAN, *Administrative Patent Judge*.

DECISION ON APPEAL

Introduction

Appellant[1] appeals under 35 U.S.C. § 134(a) from the Examiner's Final Rejection of claims 1, 2, 8, 9, 15, and 16. The Examiner indicates that claims 3–7, 10–14, and 17–20 "would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims." Final Act. 13. We have jurisdiction under 35 U.S.C. § 6(b). We REVERSE.

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[1] Appellant is the Applicant, ANALOG DEVICES, INC., which the Appeal Brief identifies as the real party in interest. App. Br. 1.

Invention

The Specification discloses a receiver apparatus that "models and corrects the frequency-dependent and the frequency-independent mismatches between I and Q paths." Abstract.

Representative Claim (*key limitations emphasized*)

> 1. A signal receiver apparatus that processes an electromagnetic signal that is received by an antenna and amplified by an amplifier, comprising:
>
> *a down converter receiving the amplified electromagnetic signal to generate an I signal and a Q signal orthogonal in phase relative to the I signa*l; and
>
> *a signal processor correcting quadrature errors in the I signal and the Q signal orthogonal in phase relative to the I signal*, by generating, *based on frequency-independent mismatch errors and frequency-dependent mismatch errors in the I signal and the Q signal orthogonal in phase relative to the I signal*, a plurality of finite impulse response (FIR) coefficients and a plurality of phase compensation factors, and applying the plurality of the finite impulse response (FIR) coefficients and the plurality of the phase compensation factors to the I signal and the Q signal.

App. Br. (Claims Appendix 1).

Rejections

The Examiner rejects claims 1, 2, 8, and 9 under 35 U.S.C. § 103(a) as being unpatentable over Welz et al. (US 7,830,954 B2; Nov. 9, 2010). Final Act. 5–8.

The Examiner rejects claims 15 and 16 under 35 U.S.C. § 103(a) as being unpatentable over Welz and Langberg et al. (US 5,852,630; Dec. 22, 1998). Final Act. 9–13.

ANALYSIS

In rejecting claim 1 under 35 U.S.C. § 103(a), the Examiner finds that Welz—by generating various frequencies of test tones based on an indication signal received from a sending signal that wishes to send a wireless signal to a receiver—teaches or suggests *a signal processor correcting quadrature errors in an I signal and a Q signal orthogonal in phase relative to the I signal based on frequency-independent mismatch errors and frequency-dependent mismatch errors in the I signal and the Q signal*, where the *I signal and Q signal* are generated by *a down converter receiving an amplified electromagnetic signal*. Final Act. 4 (citing Welz col. 17, ll. 22–32).

Appellant contends the Examiner erred because "instead of generating filter coefficients on the basis of the I/Q imbalance seen in the I and Q signals derived from a wireless signal . . . , Welz generates such coefficients based on the I/Q imbalance of internal test tones, which are not the same as the received wireless signal." App. Br. 3–4.

In response, the Examiner notes "[t]he test tones may be communicated to a quadrature LO mixer of a wireless receiver, such as the mixer 462 of the receiver 404, from a transmitter portion of a wireless transceiver, such as the transmitter 202 of the wireless transceiver 102." Ans. 3. However, Appellant persuasively submits "the test tones are never described in Welz as received by antenna 110, the only antenna disclosed in" Welz. Reply Br. 2.

Appellant's arguments are persuasive. Although Welz teaches "the test tones may be provided to the receiver by a transmitter portion of a wireless transceiver that includes the receiver" (Welz col. 17, ll. 30–32) and

that *after* determining filter coefficients the transceiver of Welz compensates for a phase imbalance in a received wireless signal (Welz Fig. 7), the Examiner's findings do not show that it would have been obvious to transmit the test tones as electromagnetic signals to be received, amplified, and used to correct quadrature errors in the I signal and Q signal. In particular, the Examiner relies on the depiction in Welz Figure 2 of a signal "output from amplifier 222 and 226 to the mixer 256, [where] the output from the mixer 256 is input to the receiver 204." Ans. 3. Welz Figure 2 is reproduced below.

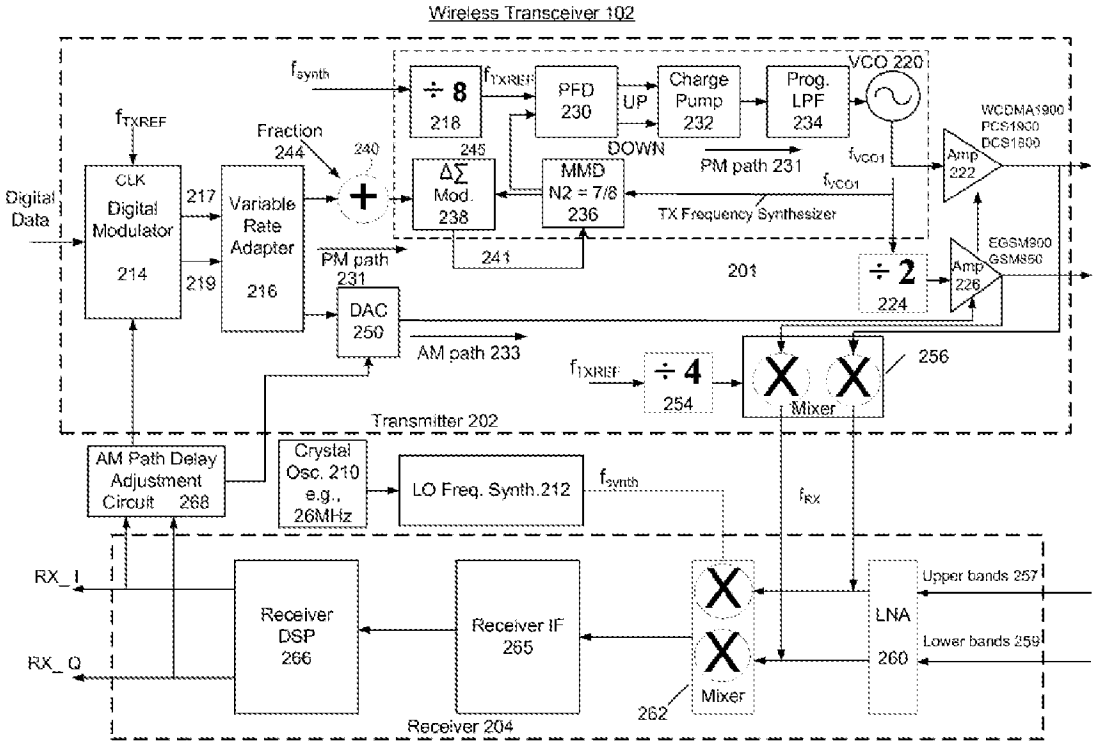

FIG.2

Welz Figure 2 is a block diagram illustrating wireless transceiver 102 comprising transmitter 202 and receiver 204. Mixer 256 (in transmitter 202) has connections (carrying signal f_{RX}) to mixer 262 (in receiver 204) that bypass low noise amplifier 260, which receives upper bands signals line 257 and lower bands signals line 259.

The fact that the Welz transmitter providing test tones is connected to the receiver compensating for I and Q signal imbalances supports Appellant's argument that there "is no basis to suppose that the mere supplying of test tones from transmitter portion 202 to receiver portion 204 is sufficient to establish that the test tones are based on a signal received by antenna 110." Reply Br. 3. That is, rather than transmitting a signal representing test tones through antenna 110—which is "provided to receive and transmit radio signals or electromagnetic signals" (Welz col. 2, ll. 40–41)—and then somehow receiving them through the same antenna or through another (non-disclosed) antenna, Welz bypasses antenna 110 without ever converting the test tones into an electromagnetic signal.

The Examiner has not presented alternative findings showing, for example, that it would have been obvious to modify Welz by substituting an outside source (e.g., a test pattern as part of the indicator signal) for the internally-generated test patterns of Welz. Therefore, we agree with Appellant that the Examiner's findings do not show that Welz renders "a signal processor correcting quadrature errors in the I signal and the Q signal" generated by a received "amplified electromagnetic signal" in the manner recited in claim 1.

Accordingly, we do not sustain the Examiner's 35 U.S.C. § 103(a) rejection of claim 1, and claims 2, 8, and 9, which contain similar recitations. The Examiner also does not show that Langberg cures the noted deficiency of Welz. *See* Final Act. 10–11. Therefore, we also do not sustain the Examiner's 35 U.S.C. § 103(a) rejection of claims 15 and 16.

DECISION

We reverse the Examiner's decision rejecting claims 1, 2, 8, 9, 15, and 16.

REVERSED