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Klymyshyn

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- (54) **MICROWAVE PHASE MODULATOR**
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- (58) Field of Search, **332/100, 144, 332/117, 127; 375/274, 302, 303, 305; 333/139, 164, 218**

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(57) **ABSTRACT**

A phase modulator for direct wideband linear phase modulation of a microwave continuous wave carrier signal which is suitable for many analog and digital phase or frequency modulation techniques. Linear phase modulation range in excess of 360 degrees is provided as a result of linear variation in the modulating signal. A conditioned baseband modulating signal is injected into a highly linear fractional range phase shifter, operating at a subharmonic of the desired output frequency. A nonlinear circuit is used to perform frequency and instantaneous phase multiplication, thus expanding the linear phase modulation range to greater than 360 degrees at the desired output frequency. With special conditioning of the baseband modulating signal, the phase modulator can be made frequency agile in ultra-small frequency steps, without requiring a stable, frequency agile reference signal or frequency synthesizer.

51 Claims, 11 Drawing Sheets

