

[54] CORIOLIS DENSIMETER HAVING SUBSTANTIALLY INCREASED NOISE IMMUNITY

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Related U.S. Application Data

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- [51] Int. Cl.⁵ G01N 9/00
- [52] U.S. Cl. 73/32 A
- [58] Field of Search 73/861.38, 32 A, 861.37

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[57] ABSTRACT

Apparatus and accompanying methods for use therein for a Coriolis mass flow rate meter which is substantially immune to noise, and more particularly, to such a meter that is substantially unaffected by noise that occurs at substantially any frequency different from a fundamental frequency at which the flow tube(s) in the meter vibrate. Specifically, the meter relies on measuring mass flow rate by determining the phase difference that occurs between real and imaginary components of the discrete fourier transform (DFT) of both the left and right velocity sensor waveforms evaluated at the fundamental frequency at which the flow tubes vibrate. The fundamental frequency is located, during an initialization operation, by providing a power spectrum, determined through use of the DFT of one of the sensor signals and then selecting that frequency at which the magnitude of the power spectrum reaches a maximum value. In addition, the frequency at which both velocity sensor signals is sampled is readjusted in response to any change in the phase of one of the velocity sensor signals, as transformed using the DFT, in order to assure that the sampling frequency always remains substantially equal to a pre-defined integer multiple of the fundamental frequency. Furthermore, the meter, through use of the numerical value of any such phase change, also provides a density indication which is also substantially immune to such noise.

12 Claims, 35 Drawing Sheets

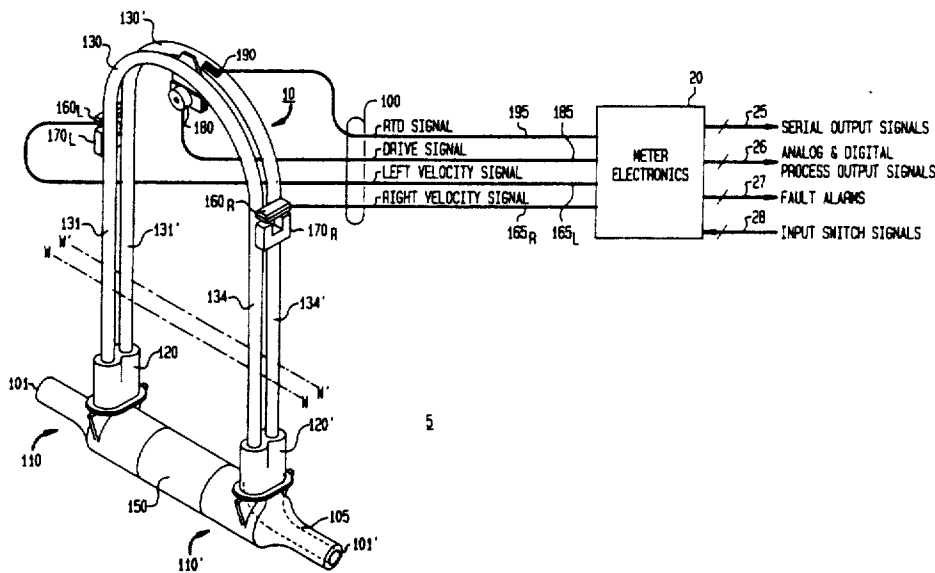
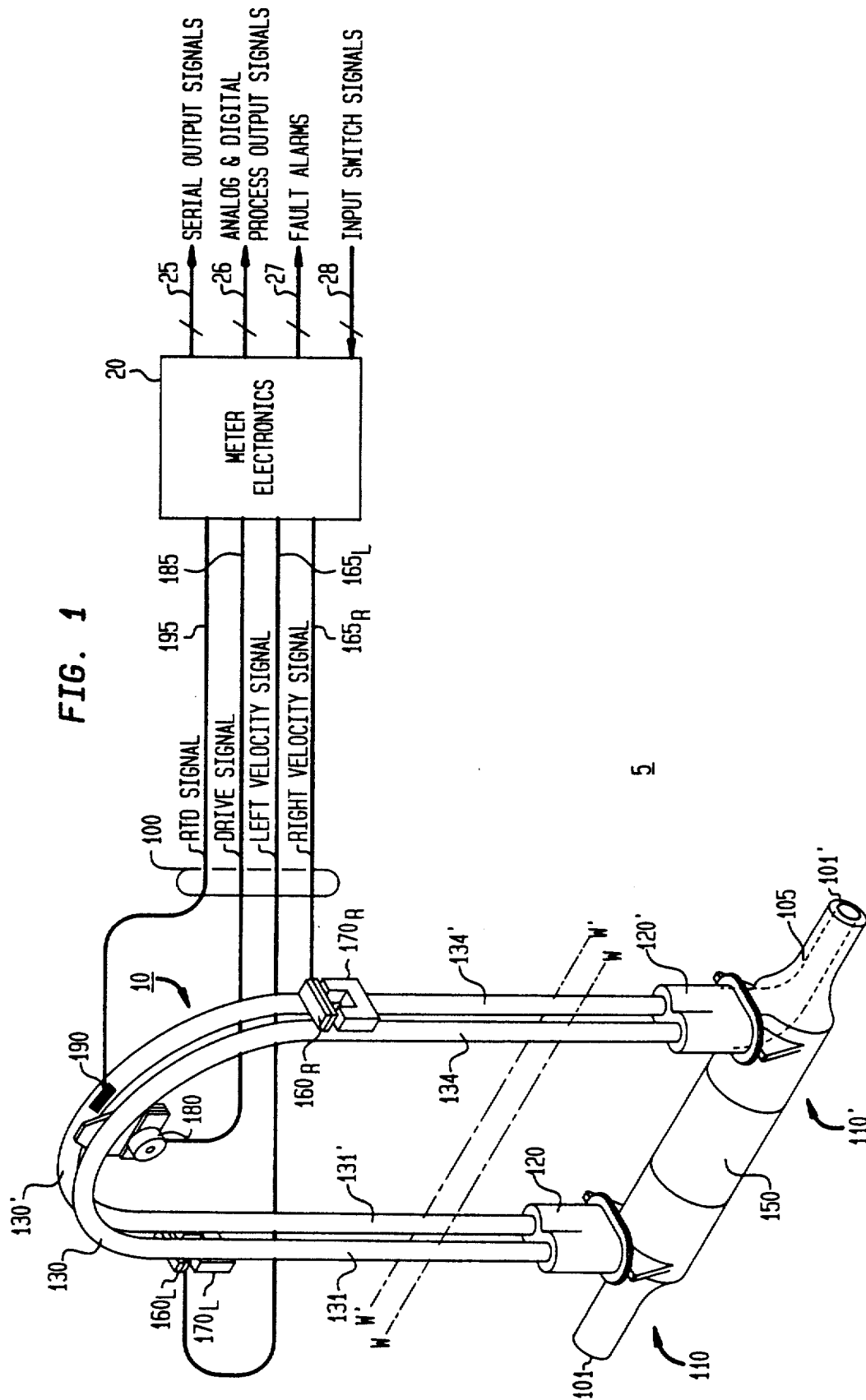


FIG. 1



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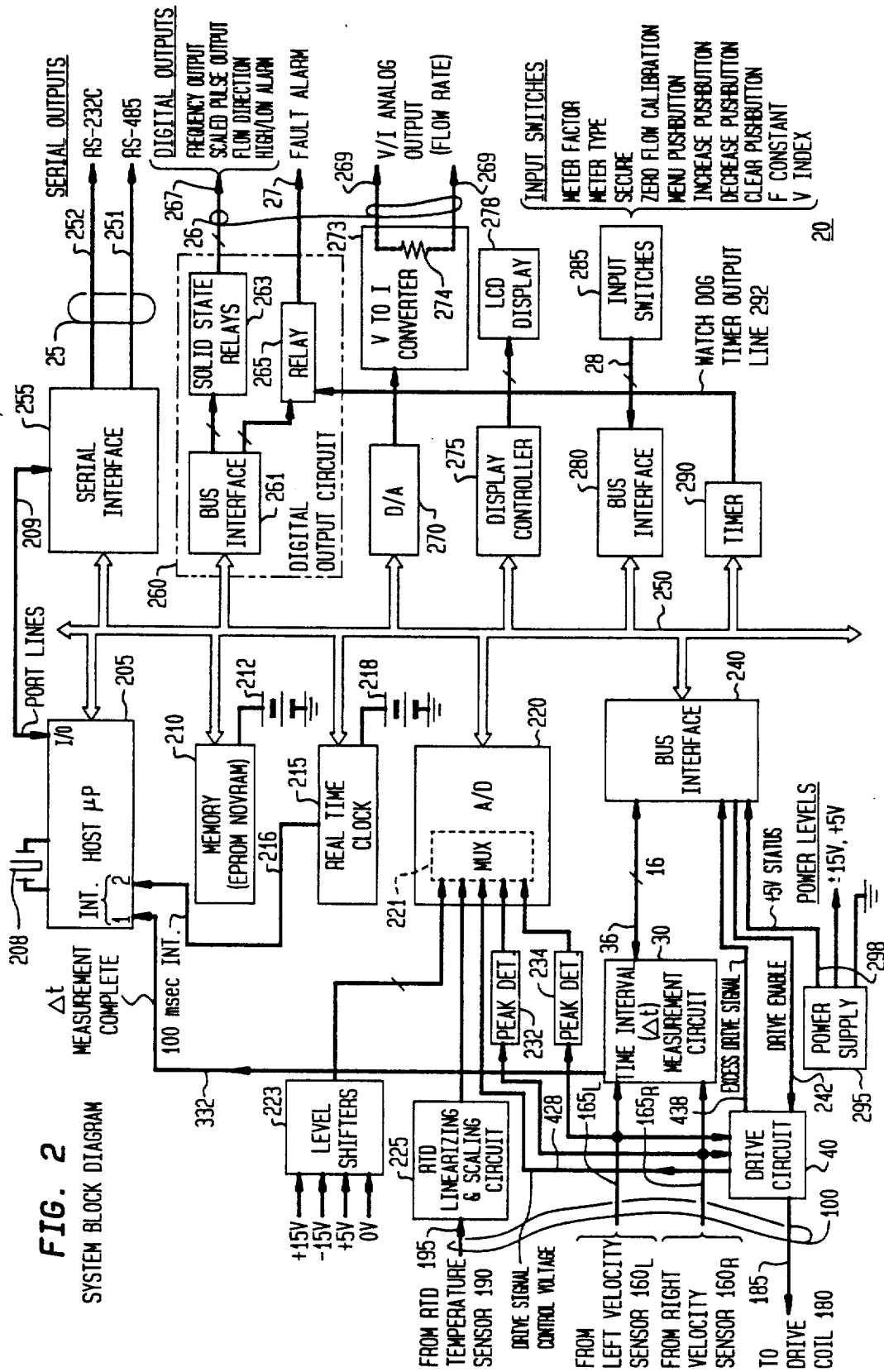


FIG. 2
SYSTEM BLOCK DIAGRAM

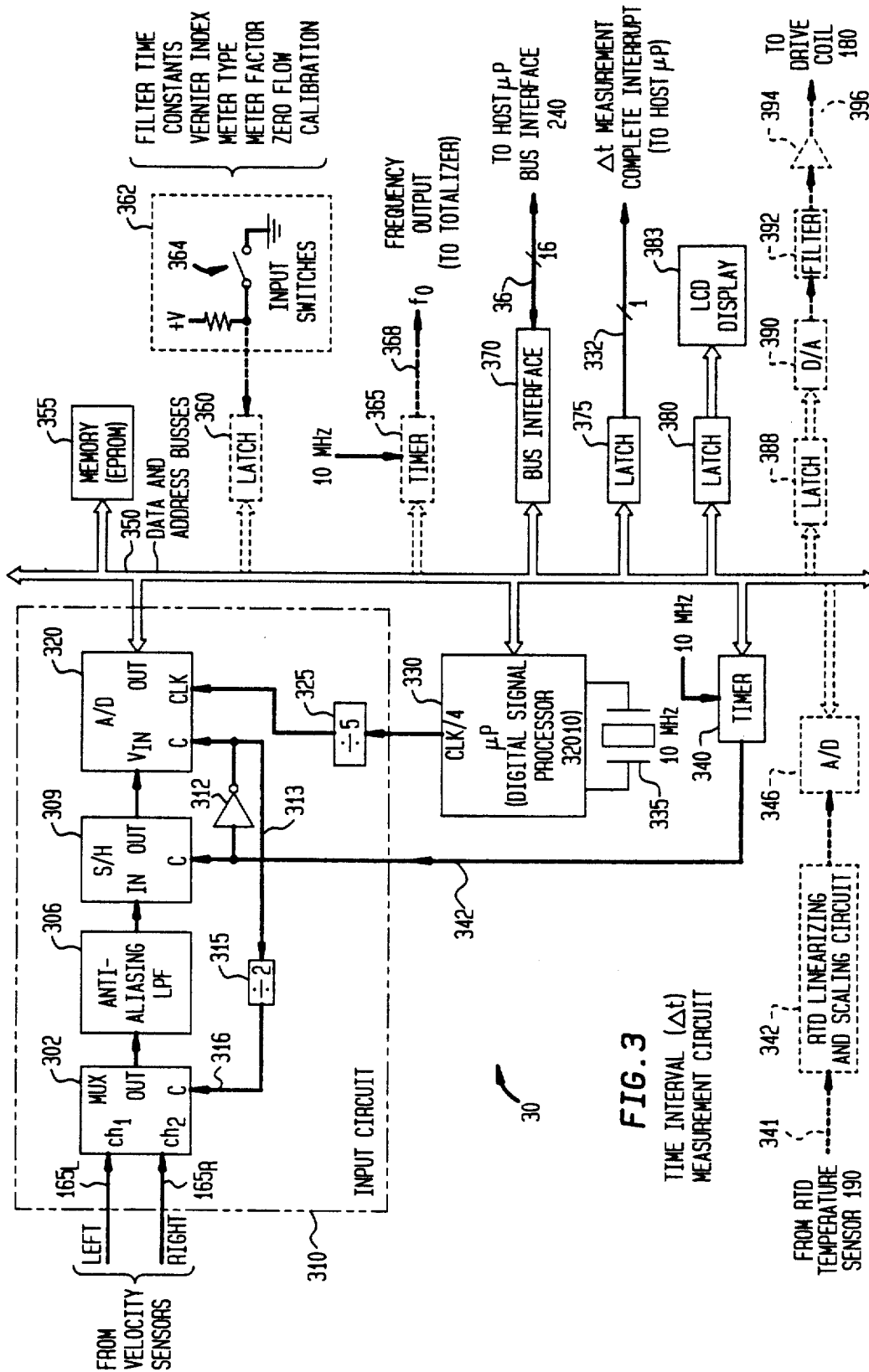
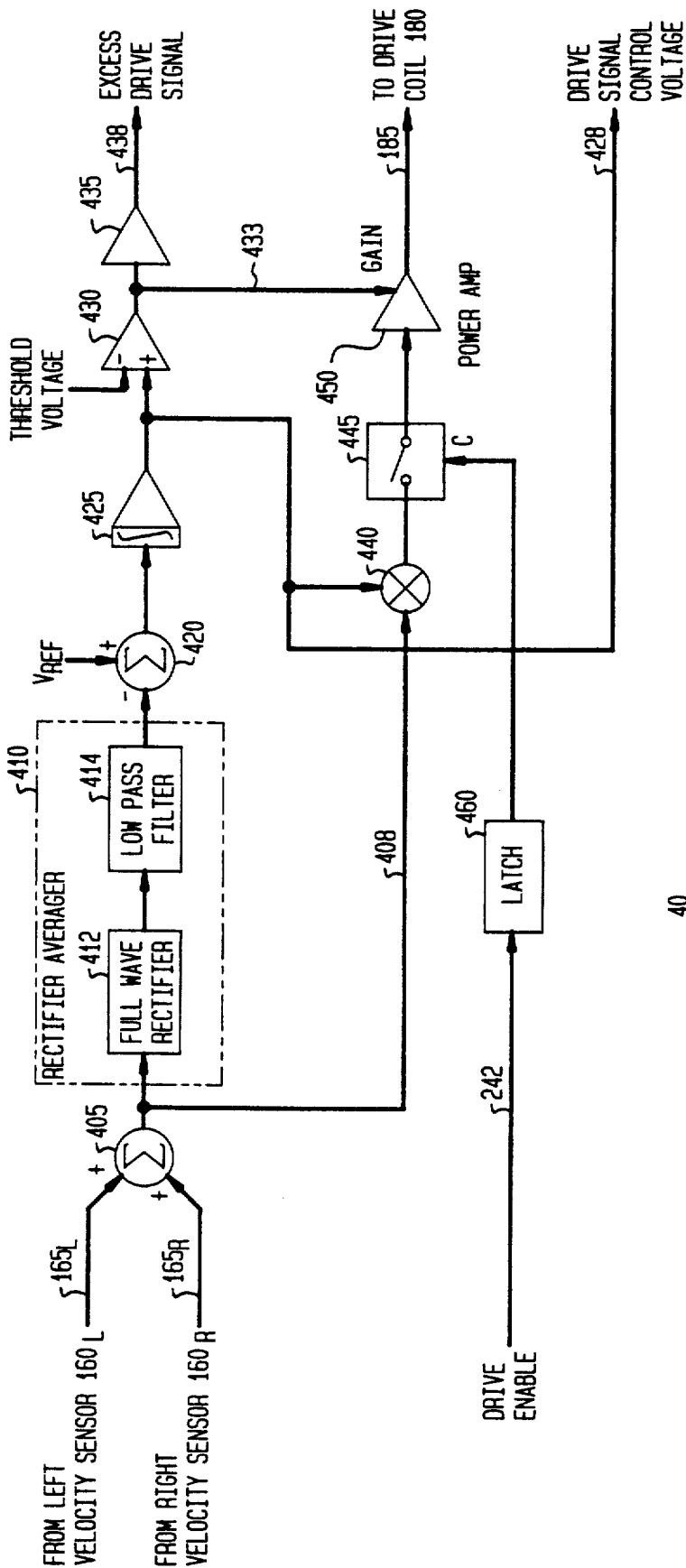


FIG. 4
DRIVE CIRCUIT 40



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