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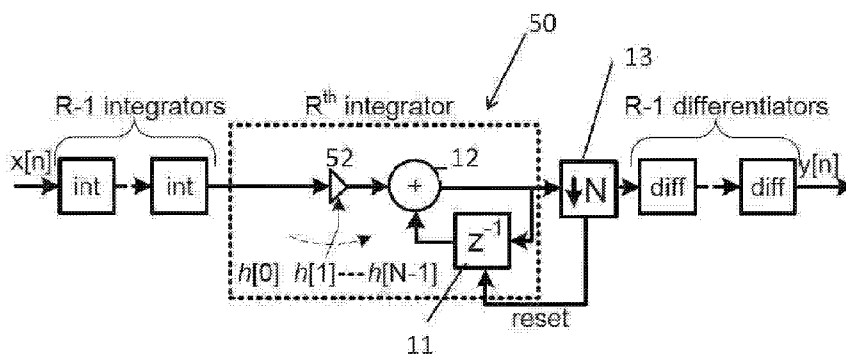


Fig. 5

(57) Abstract: In a cascaded integrator comb (CIC) filter, a time-varying gain is added before the last integrating stage transforming its sub optimal boxcar impulse response into an FIR filter of arbitrary length. Make the coefficients sparse and taking them from a set of small integers leads to an efficient hardware implementation that does not compromise any of the essential CIC filter characteristics especially the overflow handling. The proposed sparse CIC structure can improve the worst case stop band attenuation by as much as 10 dB while occupying 77% of the chip area and consuming 30% less power compared to a standard a 5th order CIC filter, and reducing the overall bit growth of the filter and the amount of high rate operations. Design examples are given illustrating the advantages and flexibility of the proposed structure.