



(12) **United States Patent**
Heiskala

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- (54) **ESTIMATION OF TWO PROPAGATION CHANNELS IN OFDM**
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- (73) Assignee: **Nokia Networks Oy**, Espoo (FI)
- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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- (21) Appl. No.: **09/468,313**
- (22) Filed: **Dec. 21, 1999**
- (51) Int. Cl.⁷ **H04K 1/10; H04L 27/28**
- (52) U.S. Cl. **370/206; 370/208; 375/260; 375/349; 455/60; 455/63**
- (58) **Field of Search** 370/203, 206, 370/207, 208, 480, 482; 375/260, 261, 267, 346, 347, 348, 349, 350; 455/296, 303, 59, 60, 63

Primary Examiner—Alpus H. Hsu
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(57) **ABSTRACT**

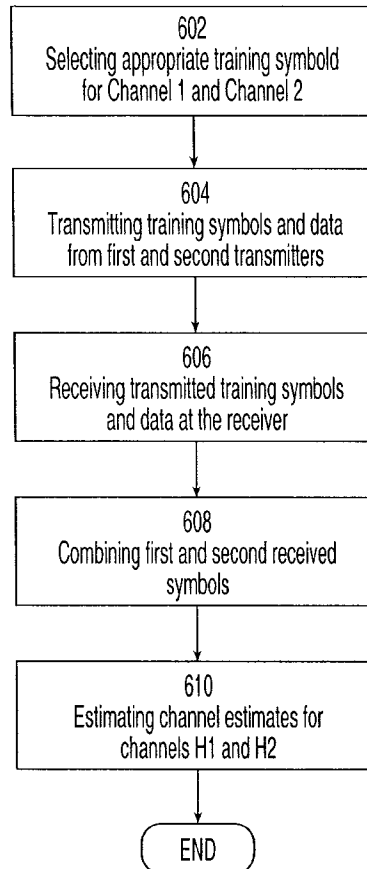
A method and apparatus for estimating separate channel frequency responses for two channels in an orthogonal frequency division multiplexing system with two transmitters is disclosed. The channel frequency responses are estimated using specifically selected training symbols that are broadcast from the two transmitters. The training symbols are specifically selected so as to improve the estimation of the channel frequency responses for each channel, while requiring the same amount of training symbols as in an estimation of the channel frequency response of a single channel.

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20 Claims, 5 Drawing Sheets



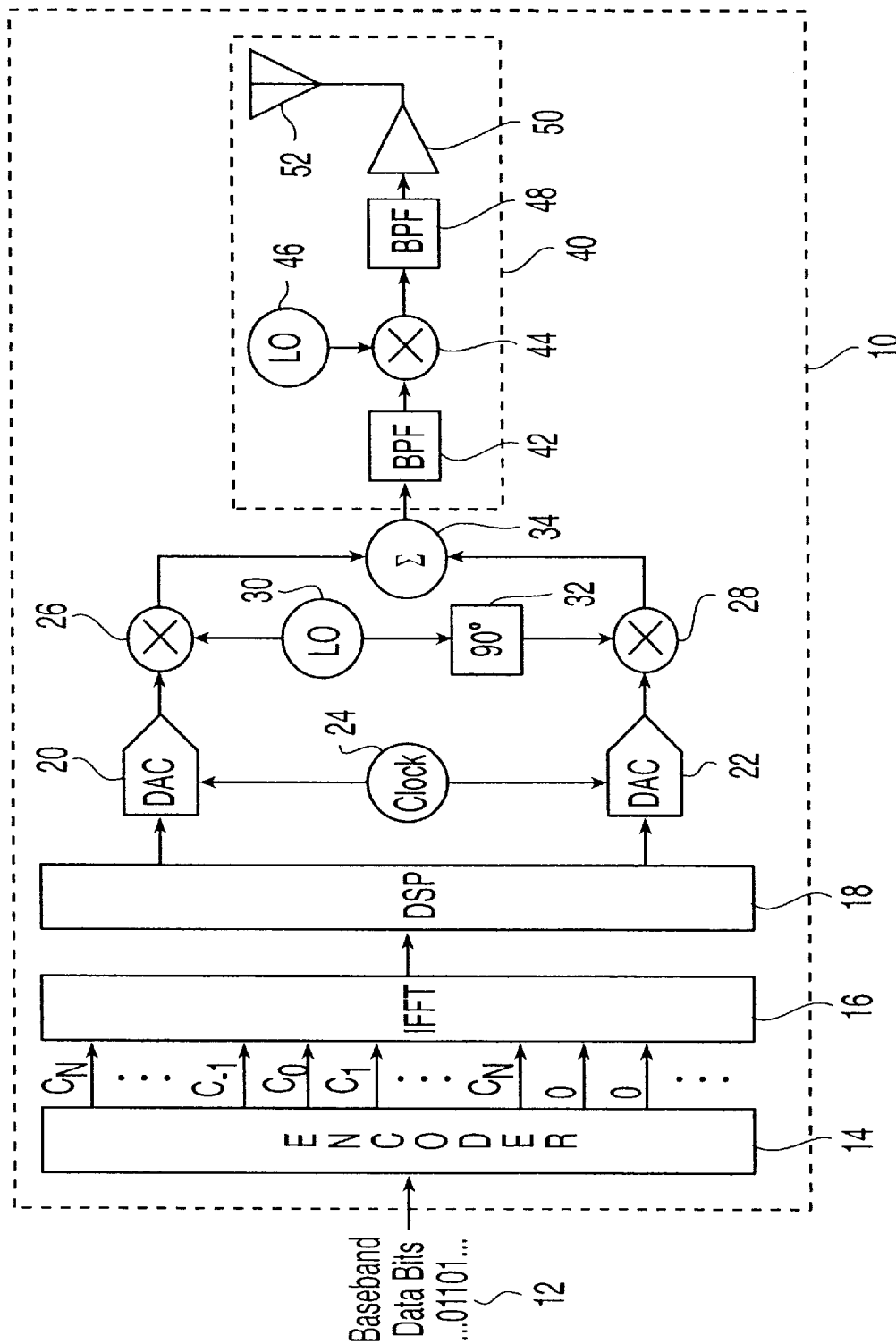


Figure 1
(Prior Art)

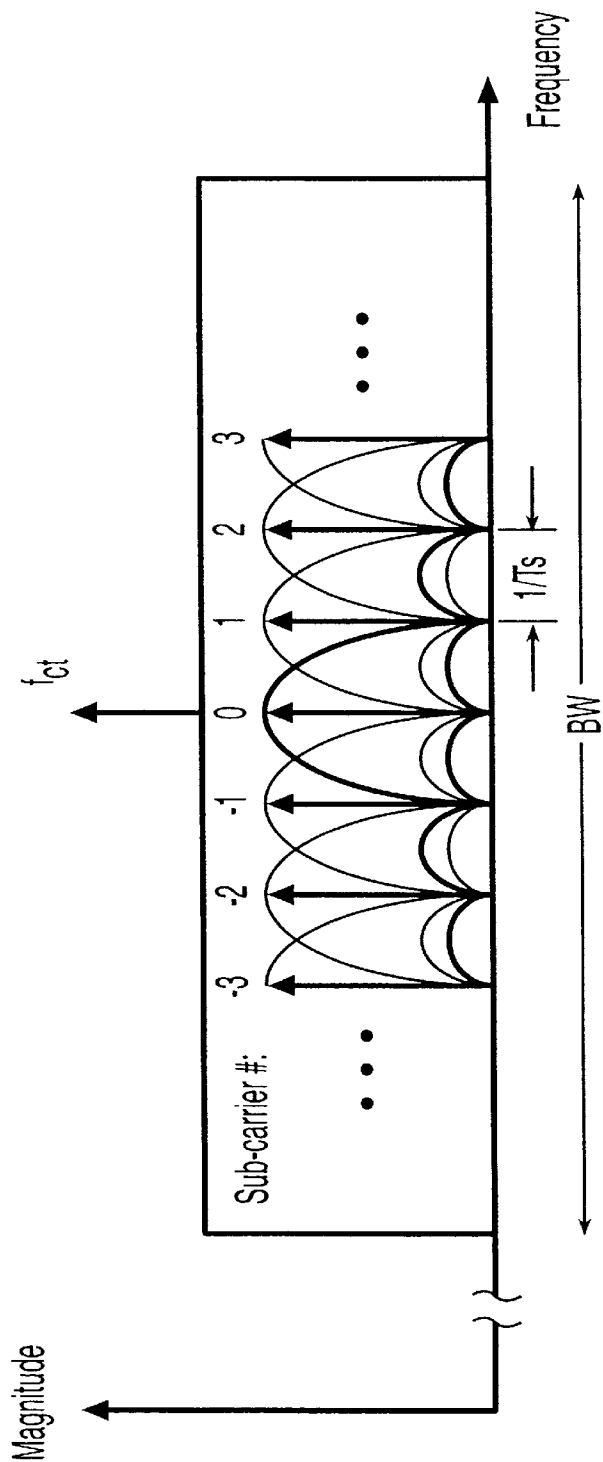


Figure 2
(Prior Art)

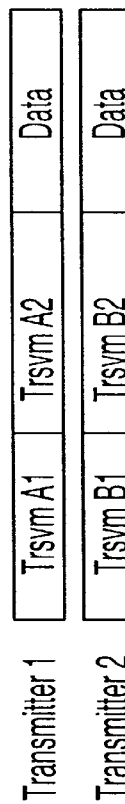


Figure 5

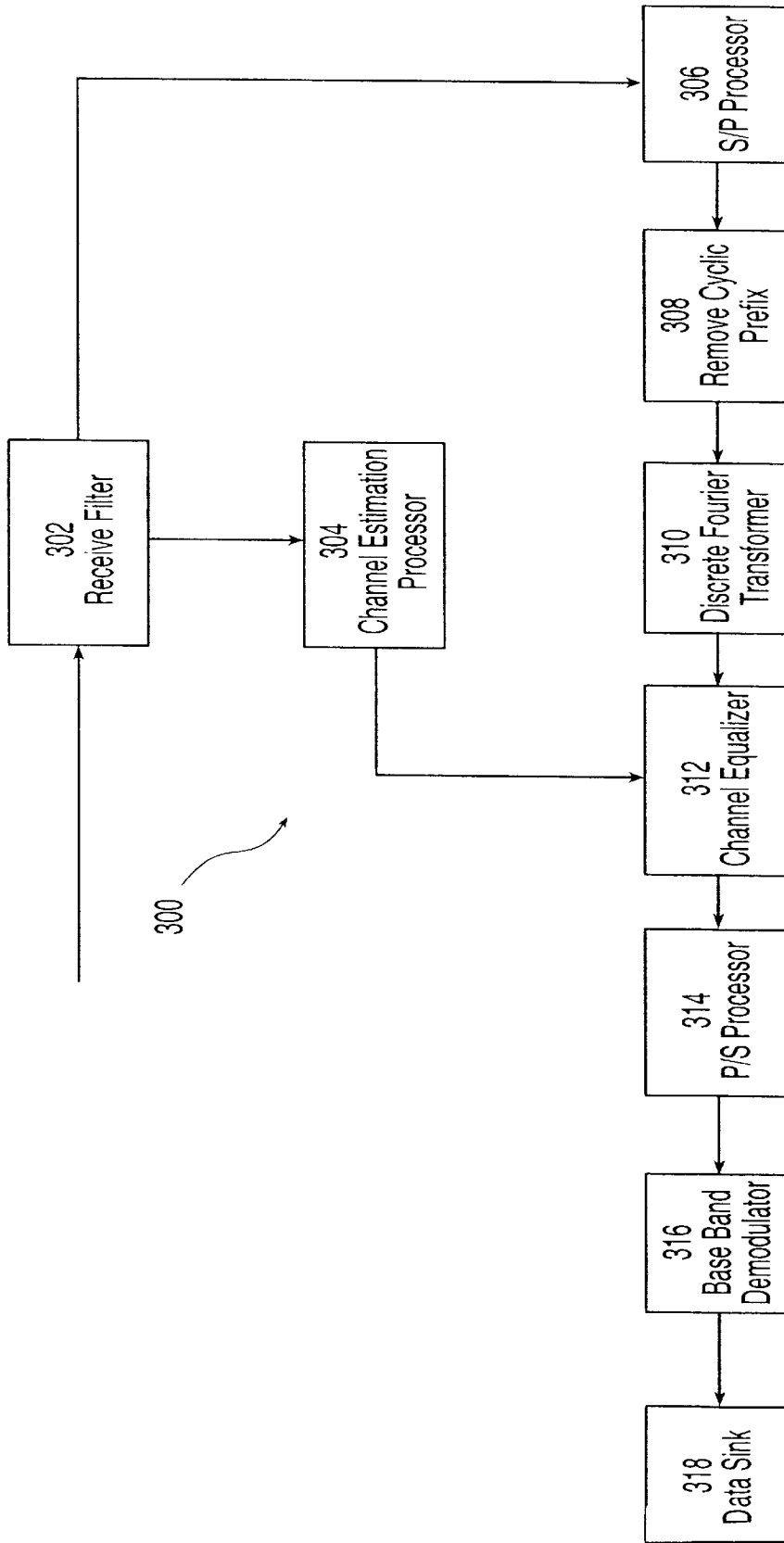


Figure 3

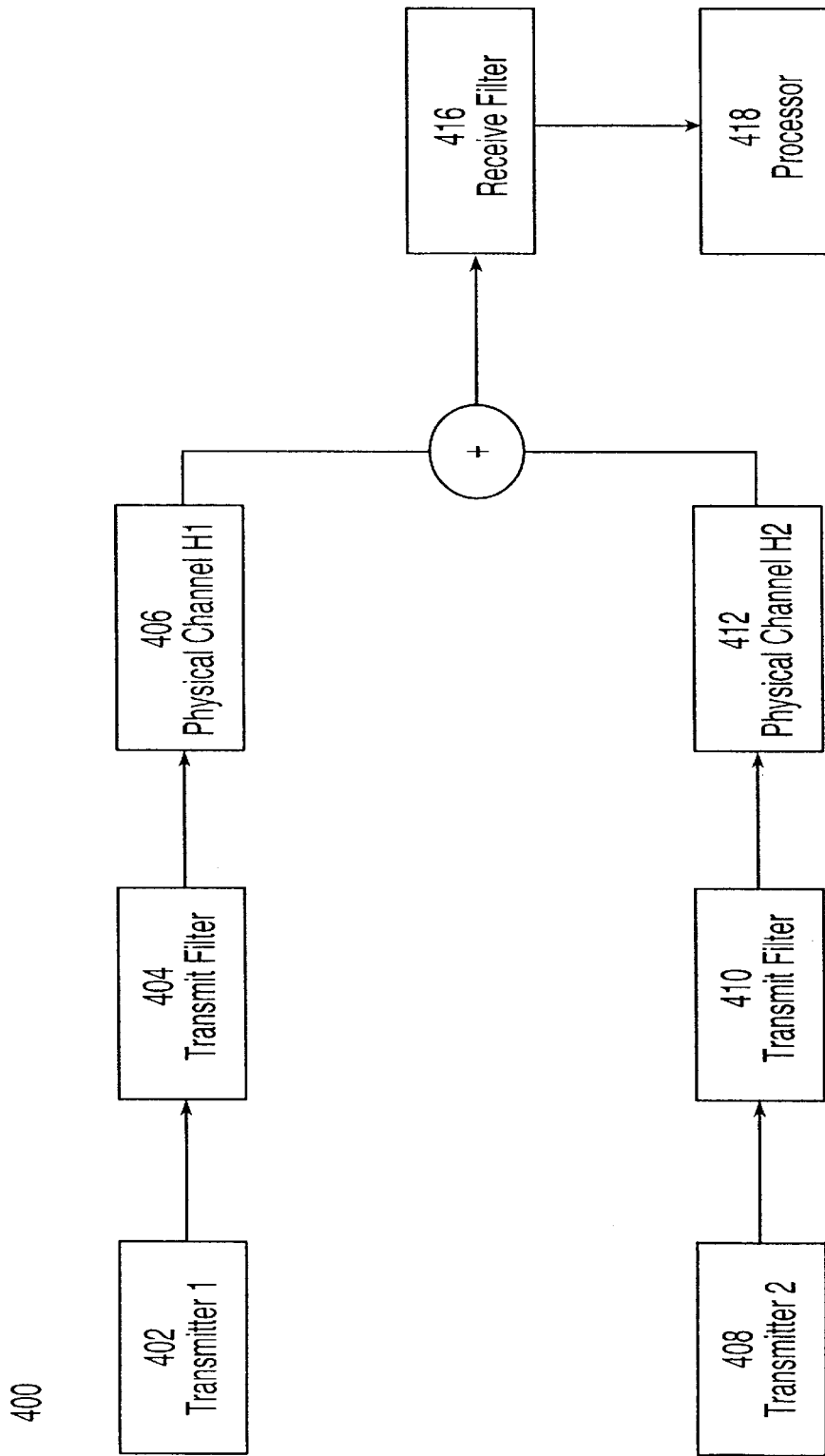


Figure 4

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