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# (12) United States Patent

Mao et al.

(54) ADAPTIVE BEAM-FORMING SYSTEM USING HIERARCHICAL WEIGHT BANKS FOR ANTENNA ARRAY IN WIRELESS COMMUNICATION SYSTEM

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patent is extended or adjusted under 35

U.S.C. 154(b) by 300 days.

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### Related U.S. Application Data

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- (51) **Int. Cl. H01Q 3/22** (2006.01) **H01Q 3/26** (2006.01)

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(45) **Date of Patent:** 

Dec. 25, 2007

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## (57) **ABSTRACT**

An adaptive beam-forming system using hierarchical weight banks for antenna arrays in wireless communication systems is disclosed. The present invention can be applied for both reception and transmission beam-forming. The hierarchical weight banks contain weights that are pre-calculated based on pre-set beam look directions. By comparing measurements of chosen signal quality metrics for pre-set look directions, the best weights, and thus the best beam look direction, can be selected from the weight banks.

## 41 Claims, 10 Drawing Sheets

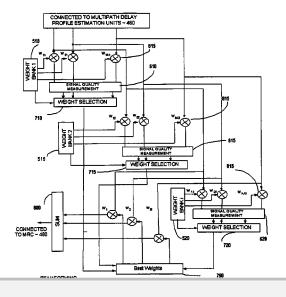




FIG. 1

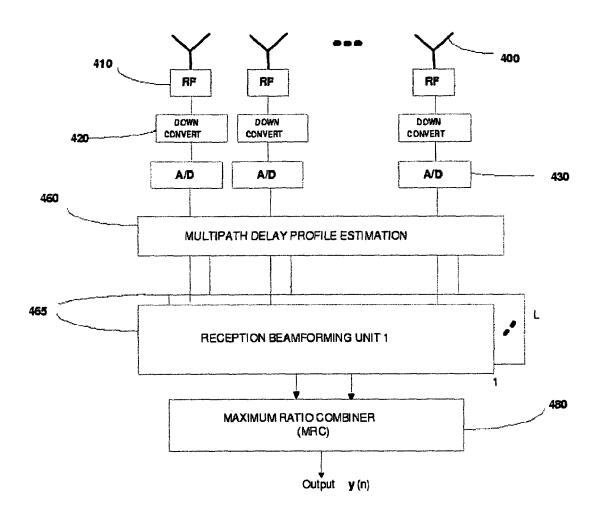


FIG. 2

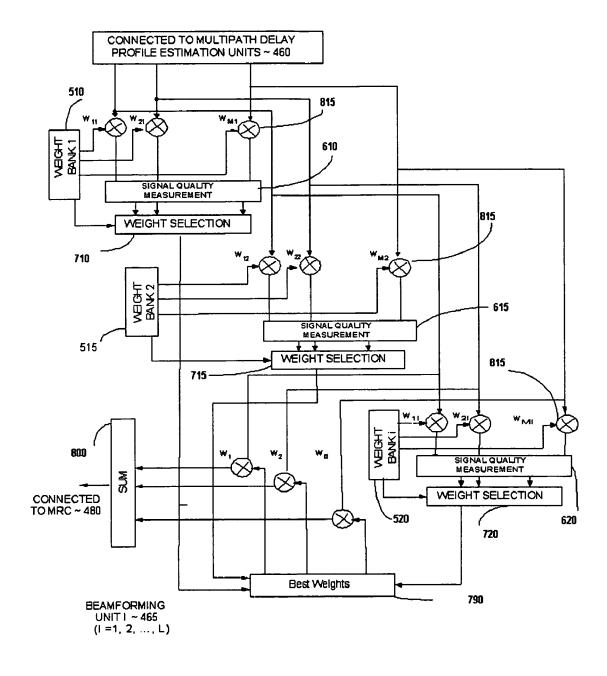
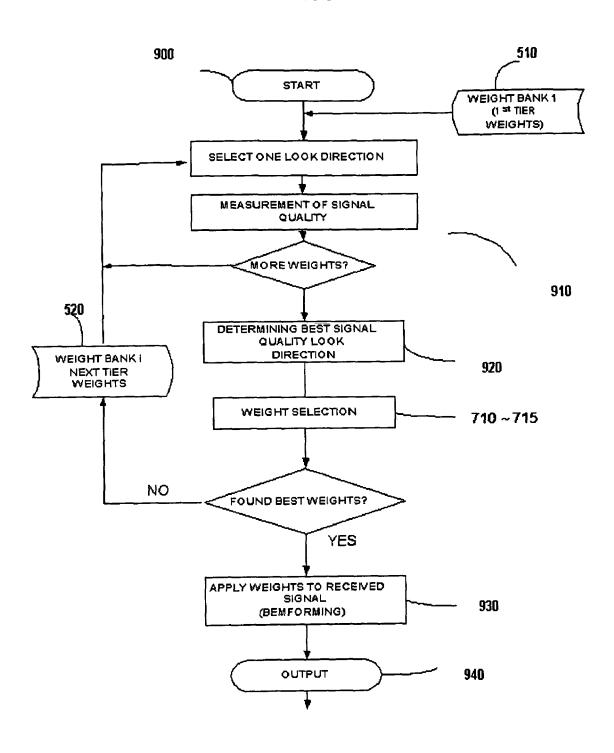
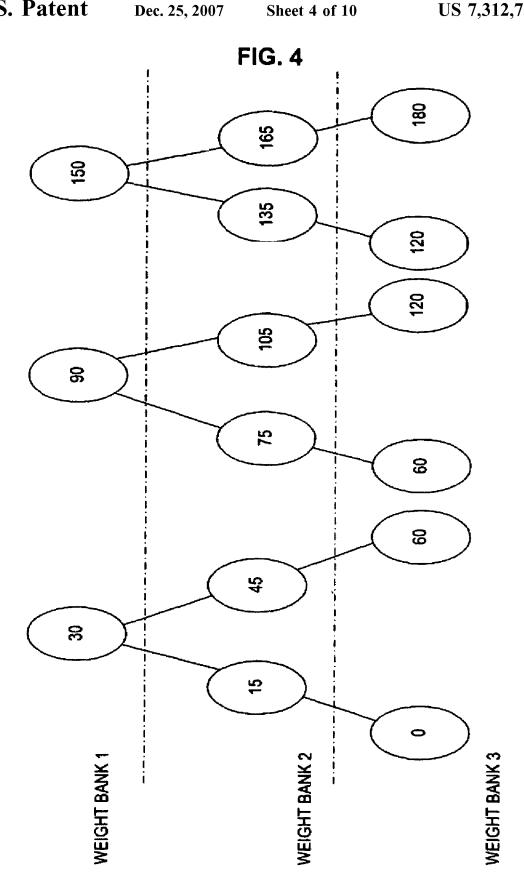


FIG. 3





The beam direction search resolution = 15°



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