US007312750B2

(12) **United States Patent**
Mao et al.

(10) **Patent No.: US 7,312,750 B2**
(45) **Date of Patent: Dec. 25, 2007**

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

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 300 days.

(21) Appl. No.: **11/071,249**

(22) Filed: **Mar. 4, 2005**

(65) **Prior Publication Data**

US 2005/0206564 A1 Sep. 22, 2005

Related U.S. Application Data

(60) Provisional application No. 60/554,408, filed on Mar. 19, 2004.

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

(52) **U.S. Cl.** **342/377**; 342/373

(58) **Field of Classification Search** 342/367, 342/373, 377, 378, 383; 455/69, 101, 562.1
See application file for complete search history.

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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

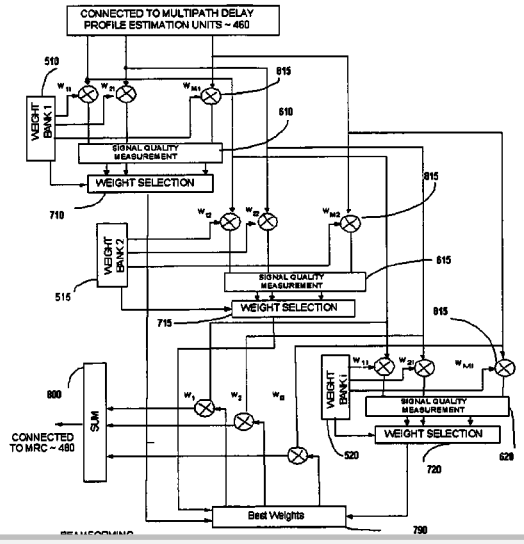

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FIG. 1

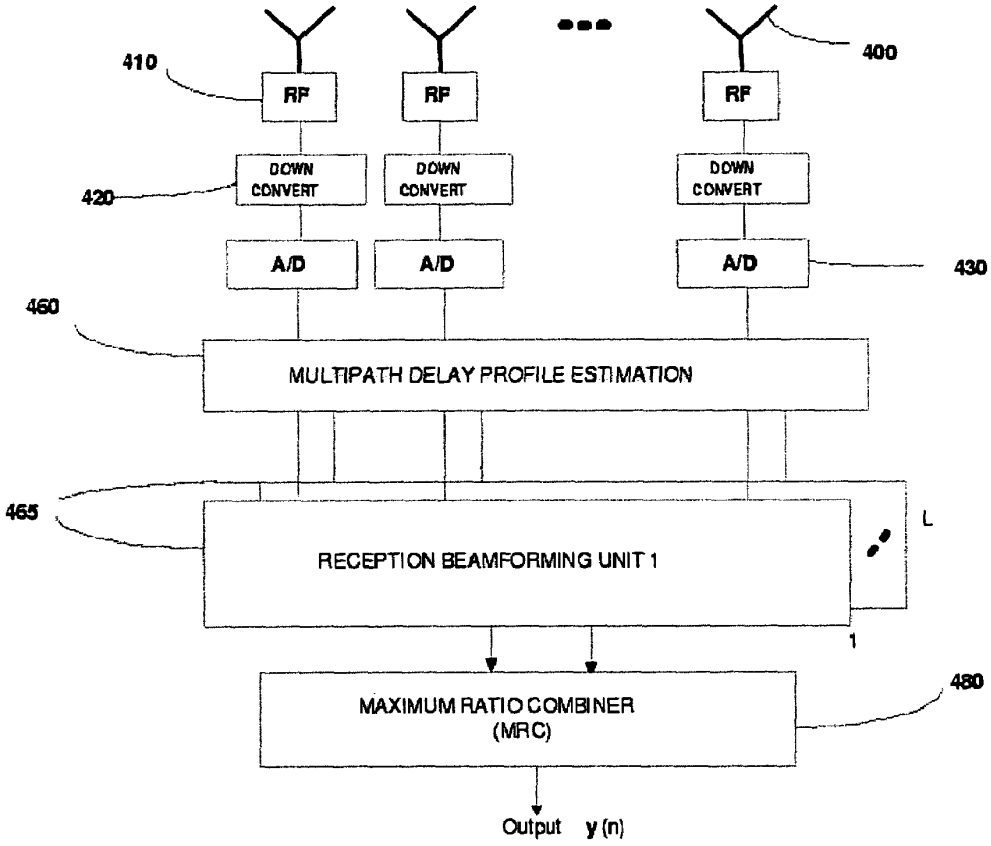

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FIG. 2

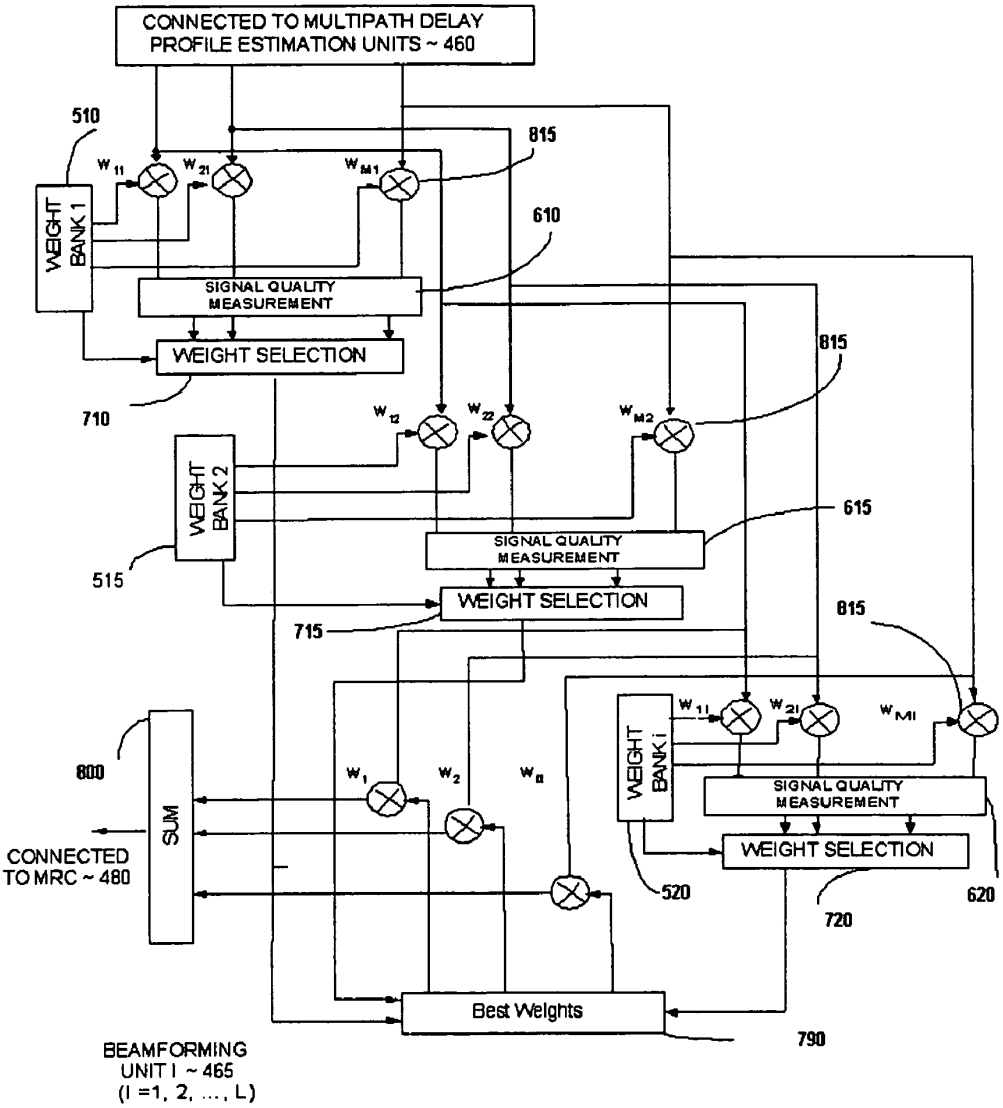

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FIG. 3

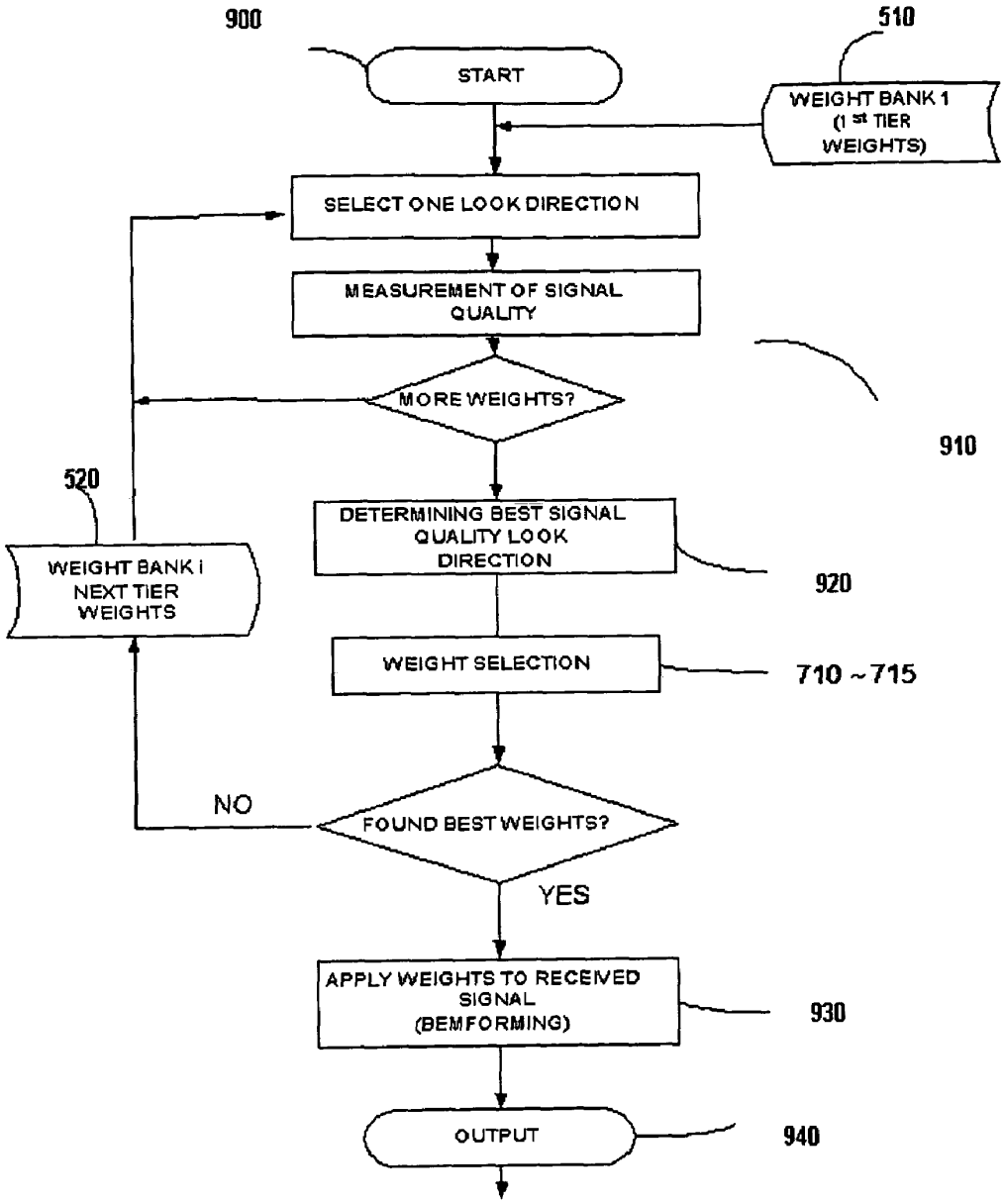

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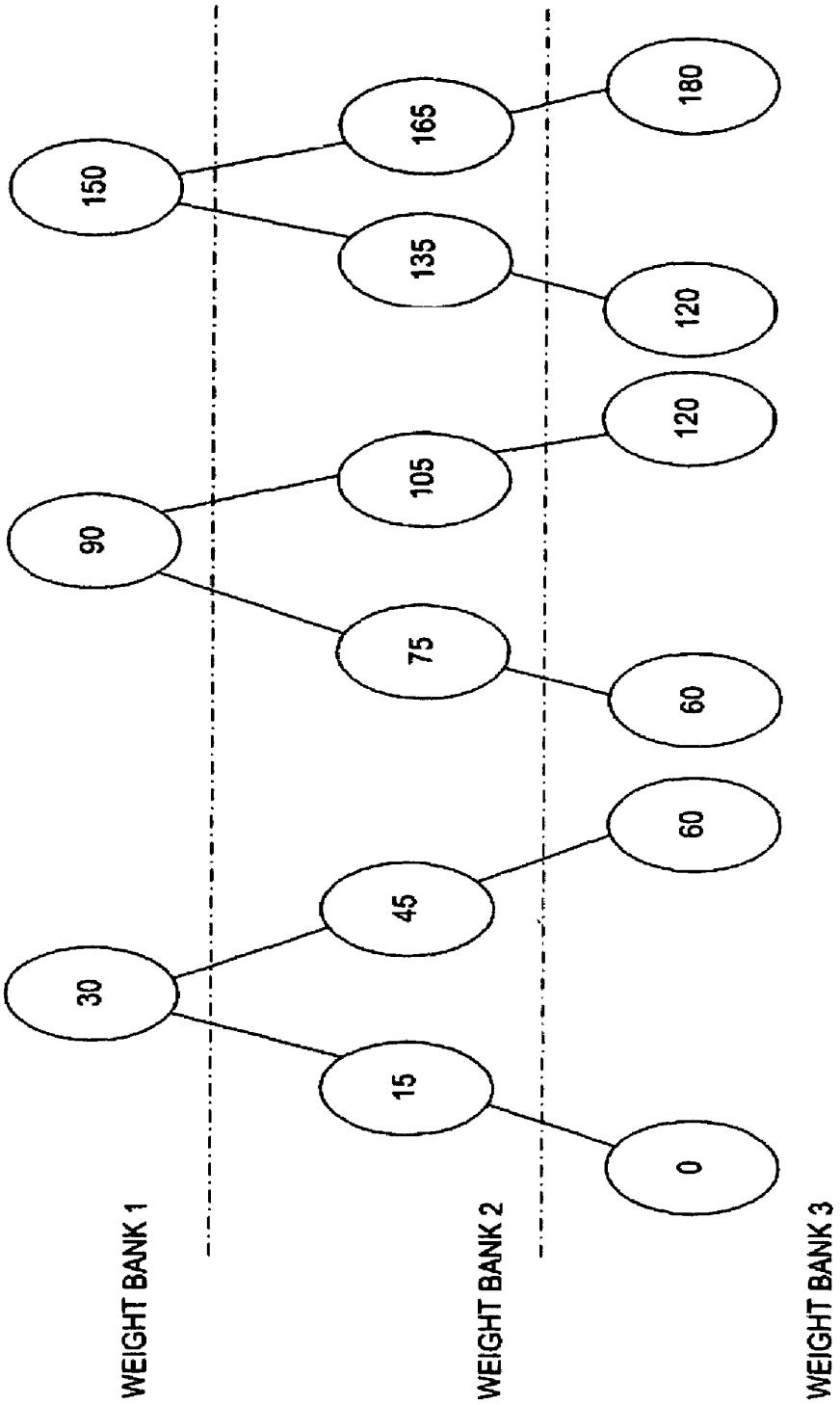
FIG. 4



The beam direction search resolution = 15°

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