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

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(54) **COMMUNICATION METHOD,
COMMUNICATION APPARATUS, AND
COMMUNICATION SYSTEM**

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(73) Assignee: **Kabushiki Kaisha Toshiba**, Tokyo (JP)

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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 764 days.

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Primary Examiner—Chau Nguyen
Assistant Examiner—Dargaye H Churnet

(65) **Prior Publication Data**

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(74) *Attorney, Agent, or Firm*—Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P.

(30) **Foreign Application Priority Data**

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(57) **ABSTRACT**

(51) **Int. Cl.**
H04L 12/26 (2006.01)

A method for exchanging channel information between a transmitter and a receiver each including antennas. A request frame including a first preamble, second preamble, and channel information feedback request is transmitted to the receiver, wherein the first preamble is transmitted from one of the antennas of the transmitter, the second preamble is transmitted from each of the antennas, and the channel information feedback request is transmitted from the one of the antennas. The request frame is received at the receiver, and the channel information feedback request is detected by a decoding based on the first preamble. Channel information is estimated using the second preamble, and a notification frame including the estimated information is constructed and transmitted to the transmitter.

(52) **U.S. Cl.** **370/252; 370/328**

(58) **Field of Classification Search** None
See application file for complete search history.

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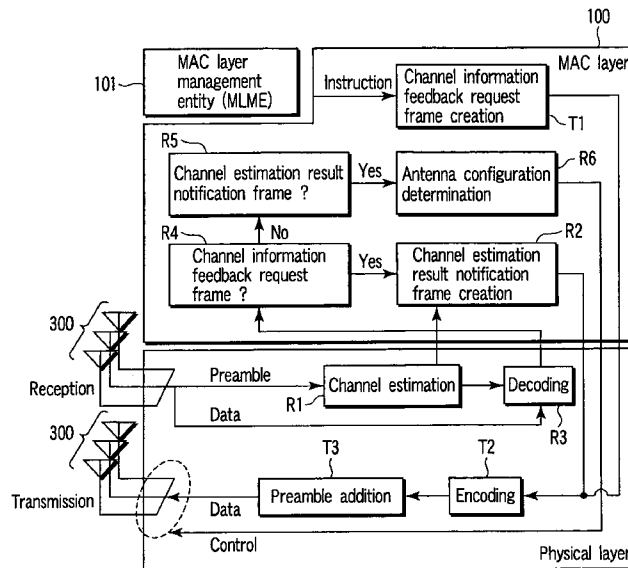
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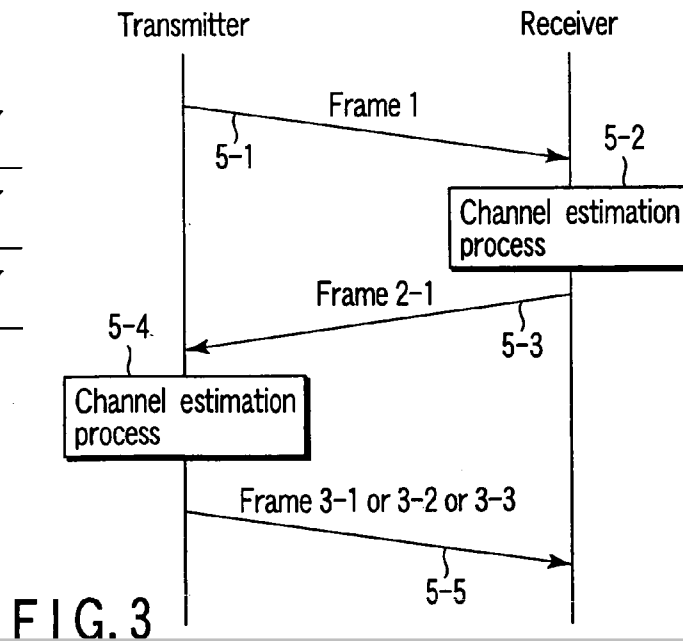
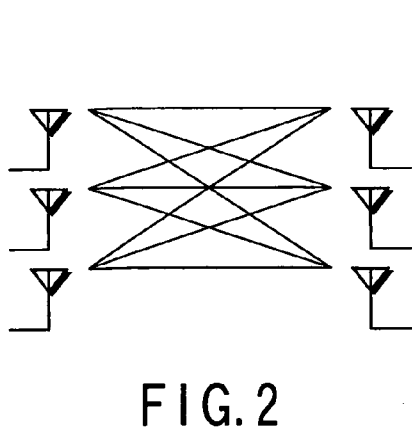
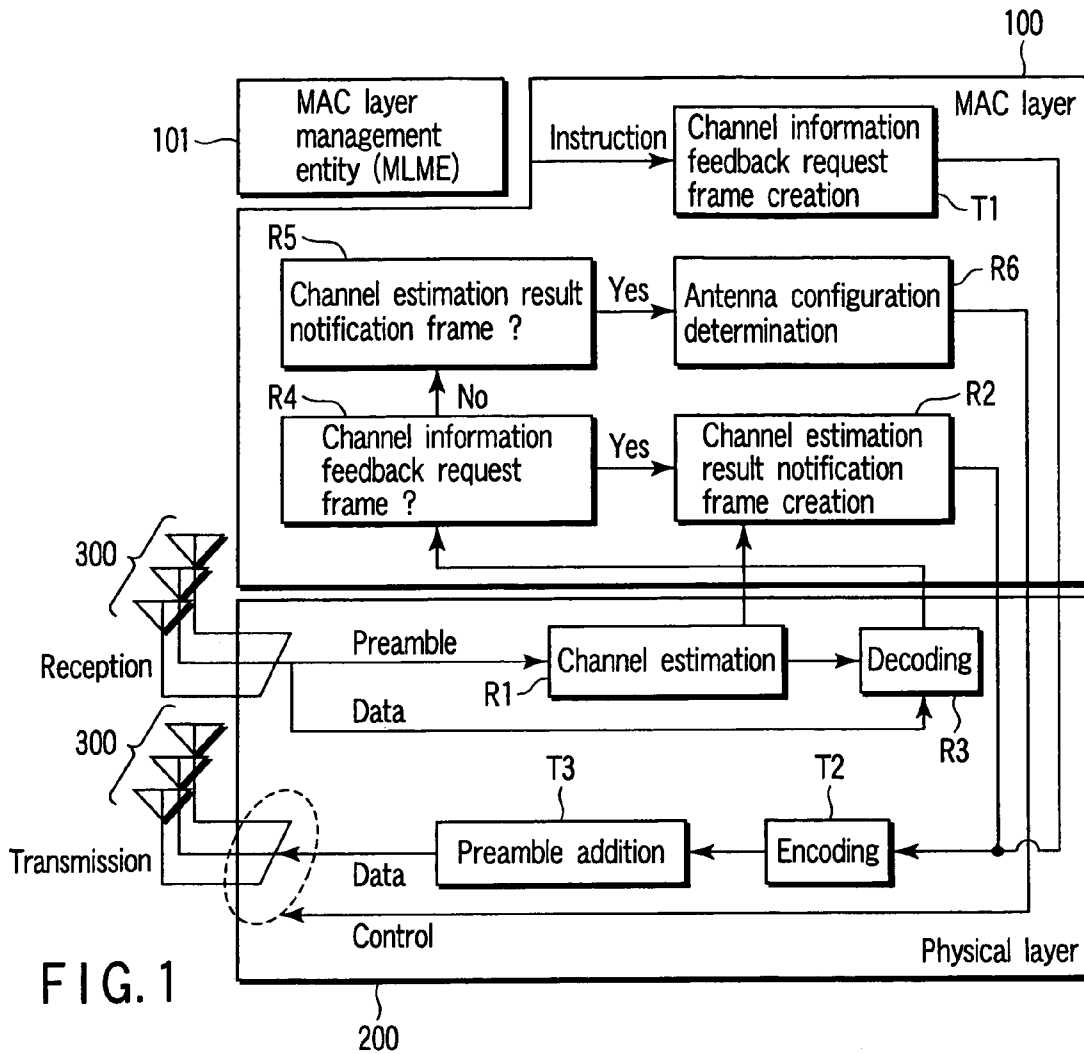
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20 Claims, 5 Drawing Sheets





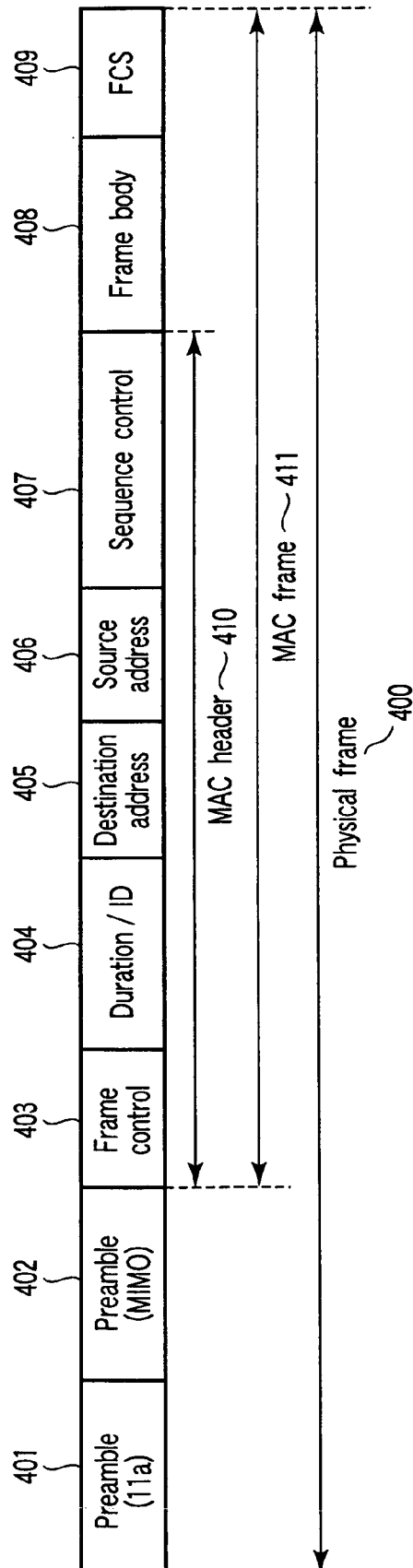


FIG. 4

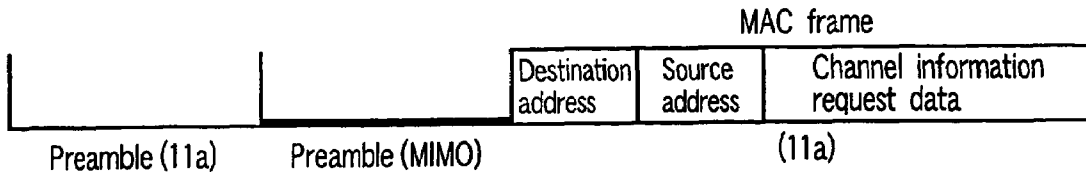
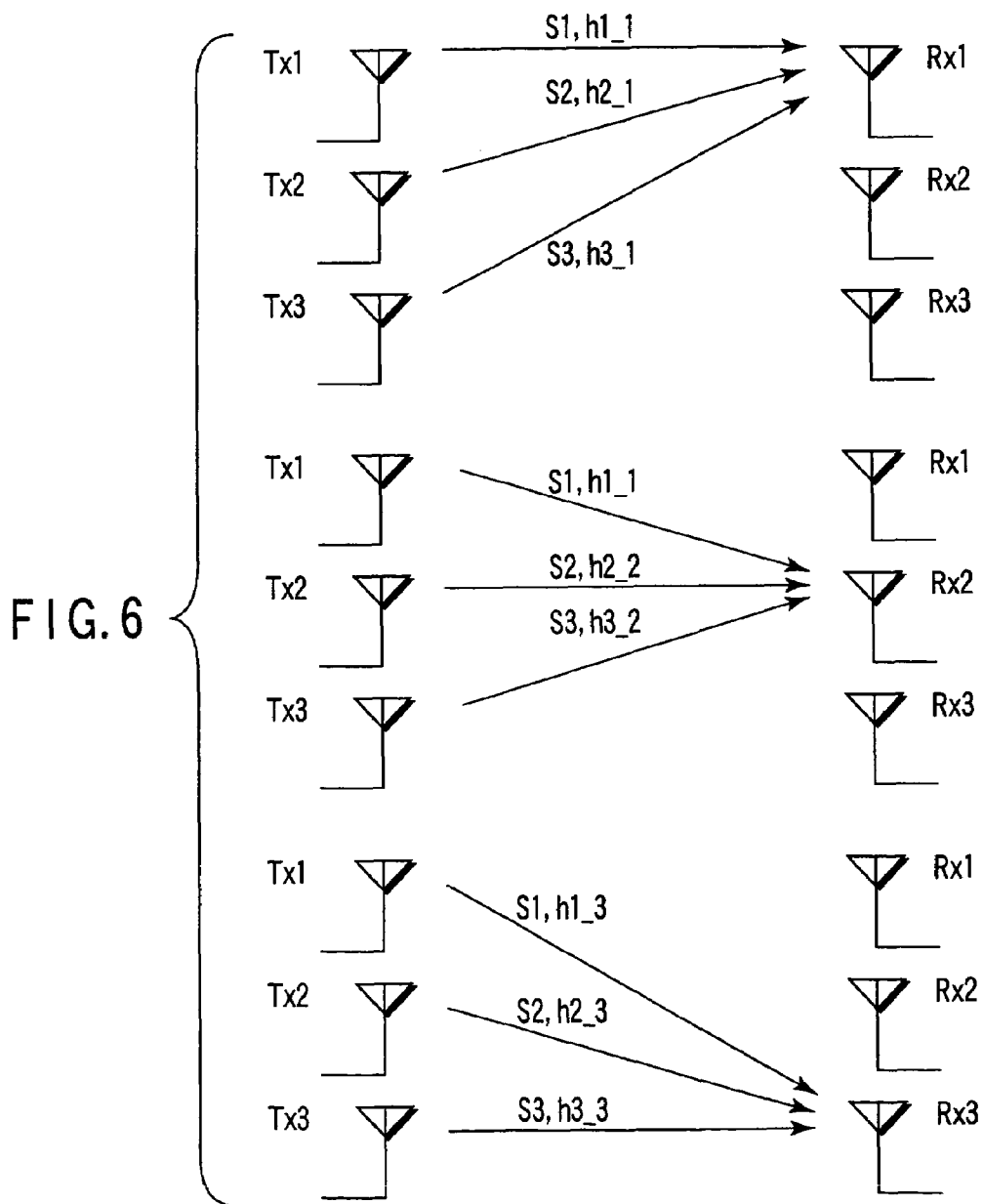


FIG. 5



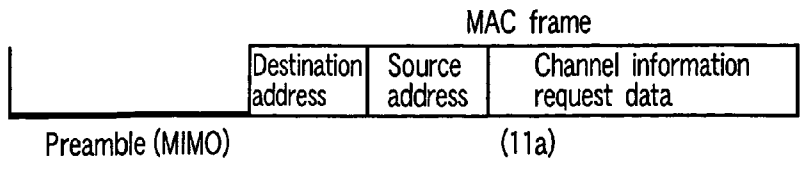


FIG. 7

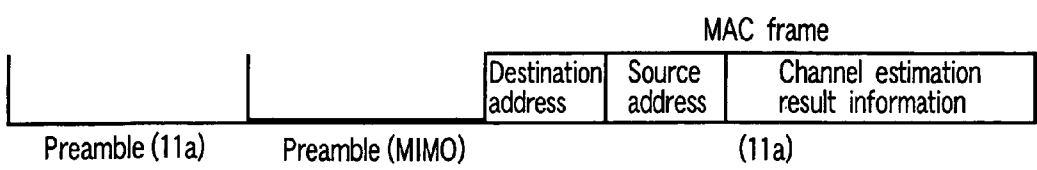


FIG. 8

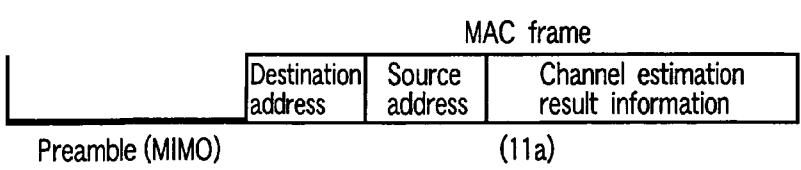


FIG. 9

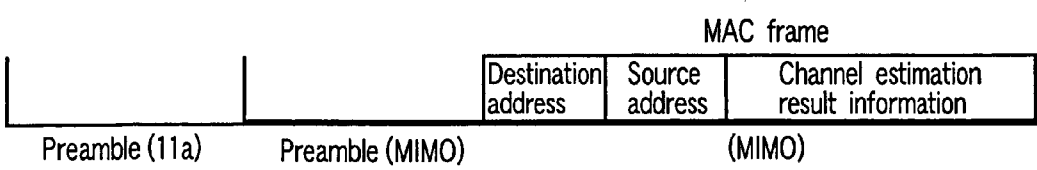


FIG. 10

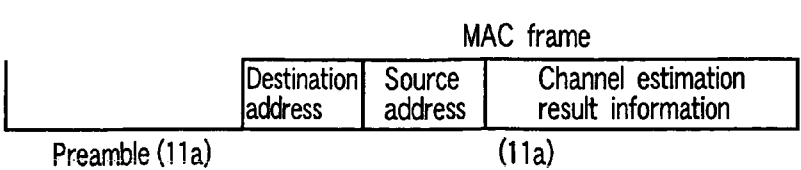


FIG. 11

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