(54) **METHOD, APPARATUS, AND SYSTEM OF WIRELESS TRANSMISSION WITH FRAME ALIGNMENT**

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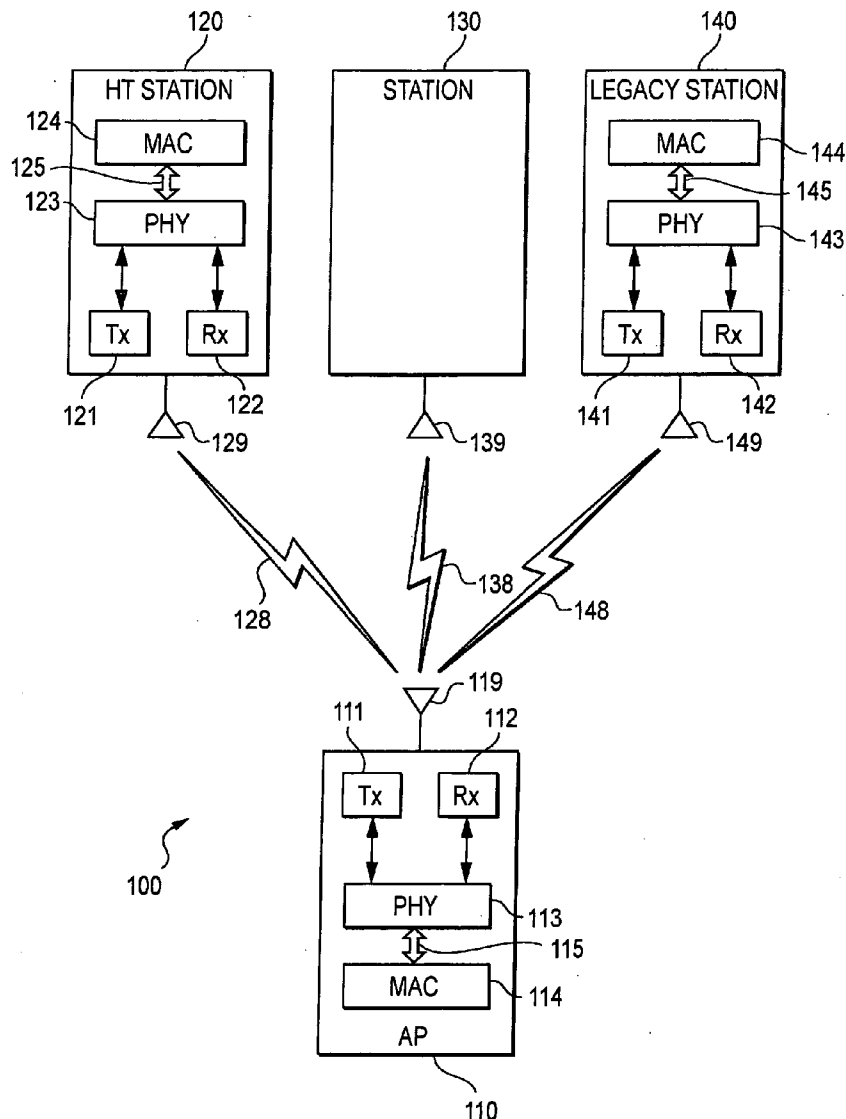
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(57) **ABSTRACT**

Embodiments of the present invention provide a method, apparatus, and system of wireless transmission with frame alignment. For example, a method in accordance with demonstrative embodiments of the invention may include synchronizing between a transmitter using a first modulation scheme, which may have multiple frame formats, and a receiver using a second modulation scheme, by calculating a transmission time that aligns an inter frame space start time of the first and second modulation schemes. Other features are described and claimed.
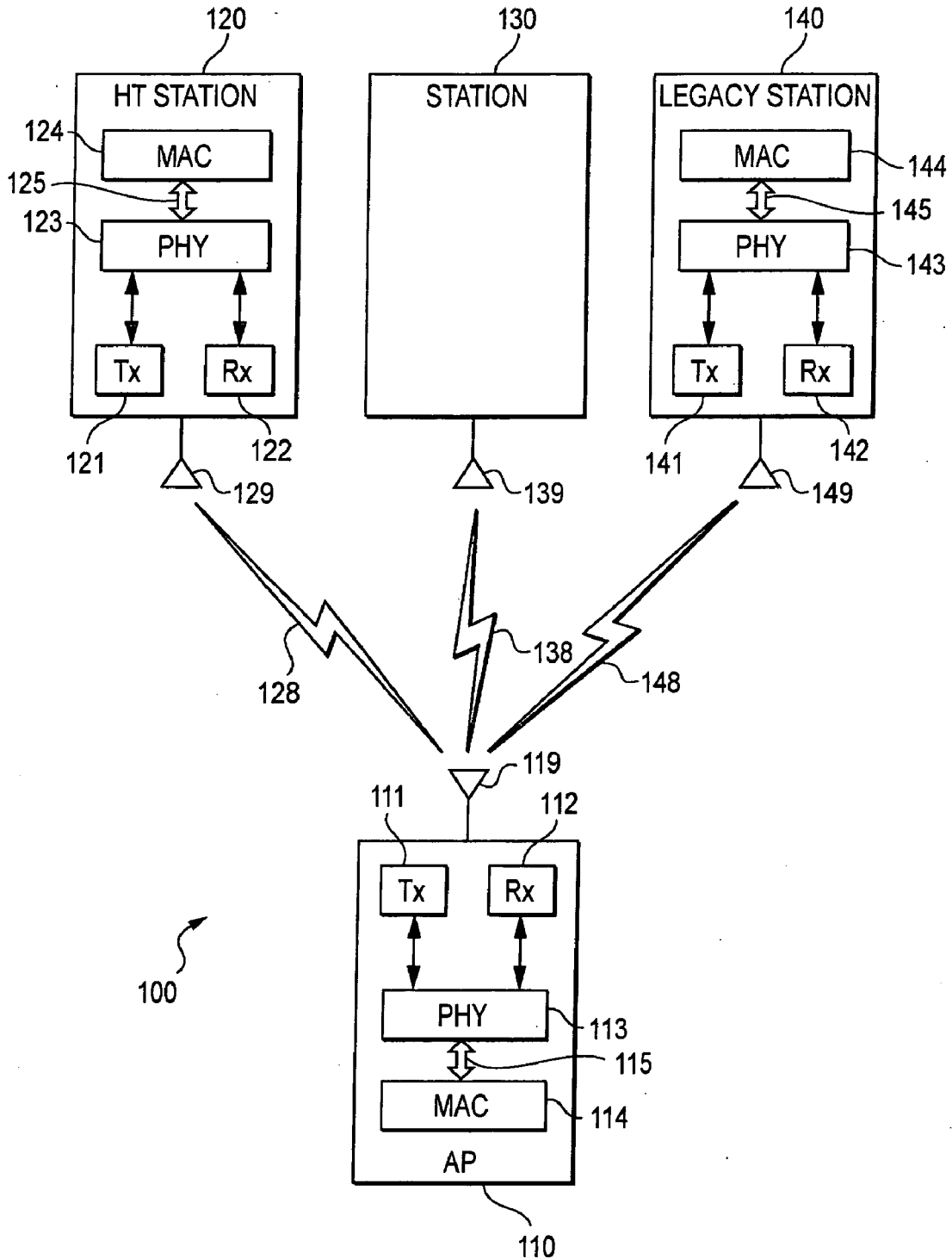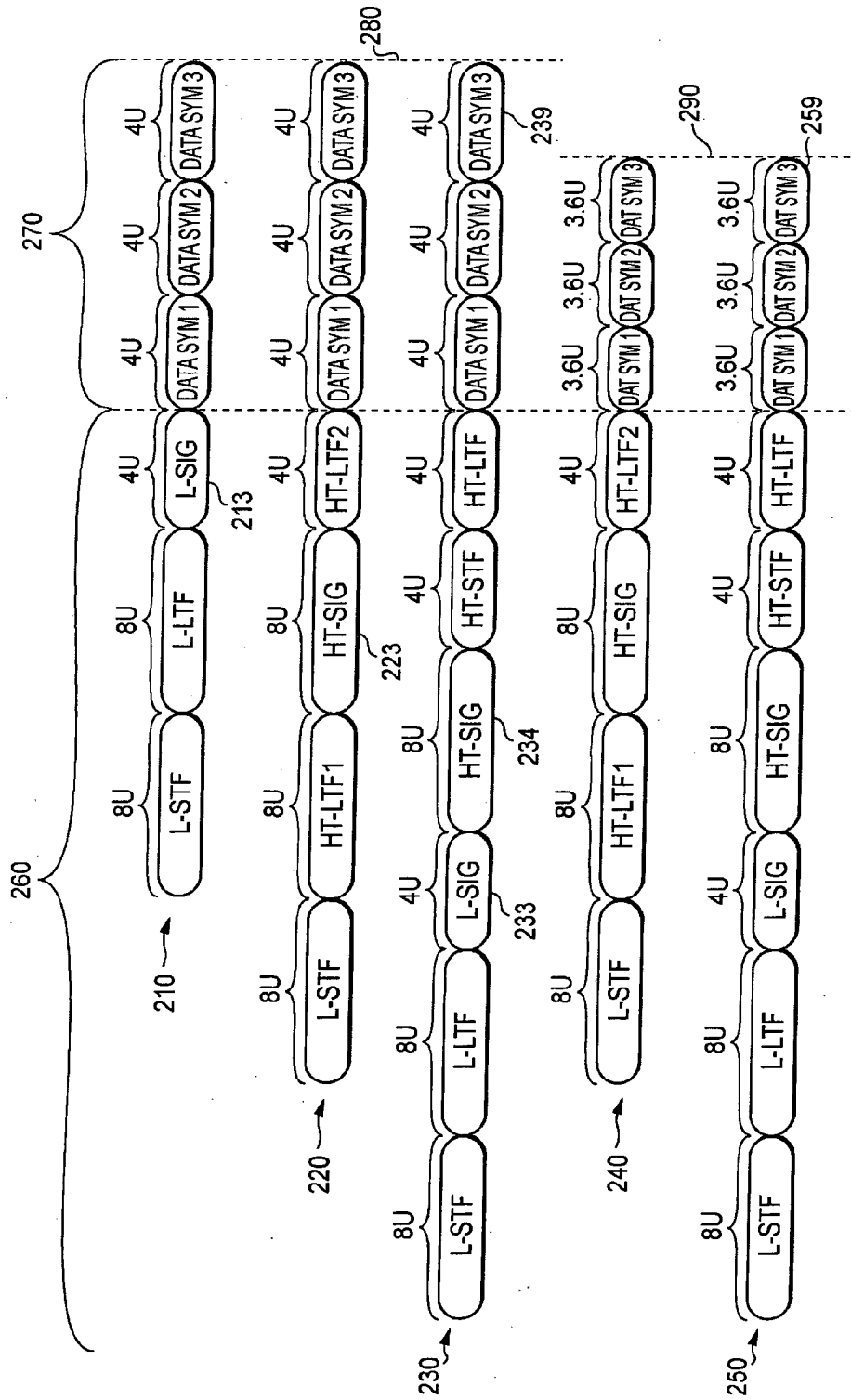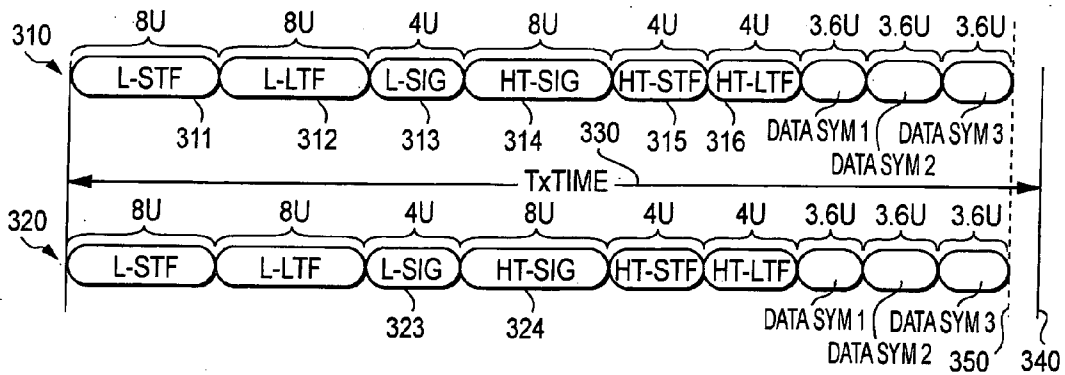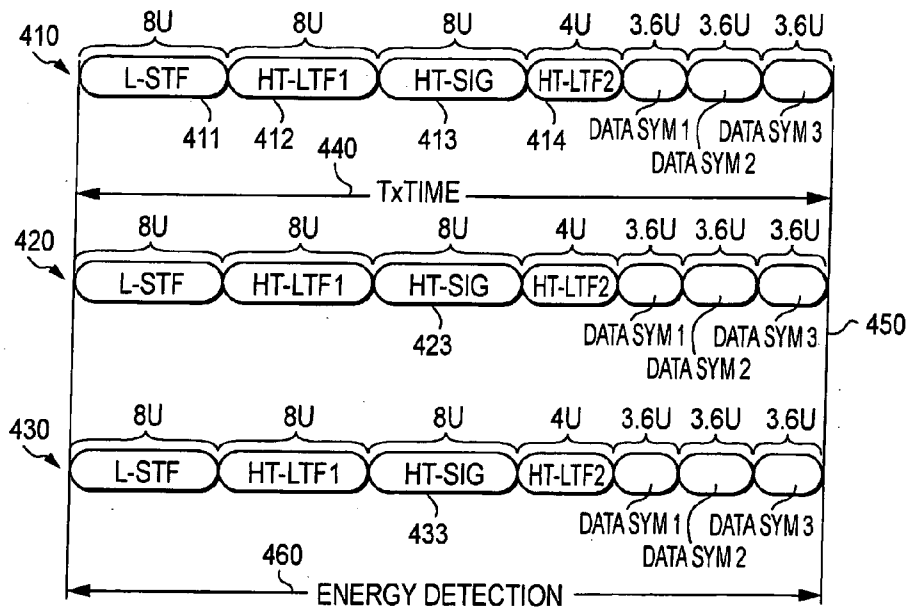
FIG. 1

FIG. 2

FIG. 3

FIG. 4

METHOD, APPARATUS, AND SYSTEM OF WIRELESS TRANSMISSION WITH FRAME ALIGNMENT

BACKGROUND OF THE INVENTION

[0001] In some wireless local area networks (WLANs), different stations may transmit frames of different modulations types. For example, the IEEE-Std 802.11, 1999 Edition (ISO/fEC 8802-11: 1999) ("802.11") set of standards allows coexistence of different formats of physical layer (PHY) protocol data units (PPDUs), or frames, in the same frequency channel. The various formats may differ, for example, in the respective sizes of the transmitted frames.

[0002] Network stations may use a channel access mechanism and a control mechanism to protect transportation of packets over the network, e.g., to avoid collision of frames. For example, a station may wait for the channel to be clear before transmitting the next frame. One solution may be to utilize a request-to-send/clear-to-send (RTS/CTS) mechanism, including setting a network allocation vector (NAV) to reserve the wireless medium for a predetermined period of time. However, such a protection method may cause significant overhead by taking up part of the available bandwidth and/or power for transmission of management frames. In addition, a network station that is in a power-save mode may not receive the RTS/CTS frames.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] The subject matter regarded as the invention is particularly pointed out and distinctly claimed in the concluding portion of the specification. The invention, however, both as to organization and method of operation, together with features and advantages thereof, may best be understood by reference to the following detailed description when read with the accompanied drawings in which:

[0004] FIG. **1** is a schematic diagram of a wireless communication system in accordance with some demonstrative embodiments of the present invention;

[0005] FIG. **2** is a schematic diagram of different frame formats that may be helpful in understanding some demonstrative embodiments of the invention;

[0006] FIG. **3** is a schematic diagram of aligned frames in accordance with one demonstrative embodiment of the invention; and

[0007] FIG. **4** is a schematic diagram of aligned frames in accordance with another demonstrative embodiment of the invention.

[0008] It will be appreciated that for simplicity and clarity of illustration, elements shown in the figures have not necessarily been drawn to scale. For example, the dimensions of some of the elements may be exaggerated relative to other elements for clarity. Further, where considered appropriate, reference numerals may be repeated among the figures to indicate corresponding or analogous elements.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0009] In the following detailed description, numerous

stood by those of ordinary skill in the art that the present invention may be practiced without these specific details. In other instances, well-known methods, procedures, components and circuits have not been described in detail so as not to obscure the present invention.

[0010] Unless specifically stated otherwise, as apparent from the following discussions, it is appreciated that throughout the specification discussions utilizing terms such as "processing,""computing,""calculating,""determining," or the like, refer to the action and/or processes of a computer or computing system, or similar electronic computing device, that manipulate and/or transform data represented as physical, such as electronic, quantities within the computing system's registers and/or memories into other data similarly represented as physical quantities within the computing system's memories, registers or other such information storage, transmission or display devices.

[0011] Embodiments of the present invention may include an apparatus for performing the operations herein. This apparatus may be specially constructed for the desired purposes, or it may comprise a general-purpose computer selectively activated or reconfigured by a computer program stored in the computer. Such a computer program may be stored in a computer readable storage medium, such as, but not limited to, any type of disk, including floppy disks, optical disks, magnetic-optical disks, read-only memories (ROM), compact disc read-only memories (CD-ROM), random access memories (RAM), electrically programmable read-only memories (EPROM), electrically erasable and programmable read only memories (EEPROM), FLASH memory, magnetic or optical cards, or any other type of media suitable for storing electronic instructions and capable of being coupled to a computer system bus.

[0012] It should be understood that the present invention may be used in a variety of applications. Although the present invention is not limited in this respect, the circuits and techniques disclosed herein may be used in many apparatuses such as units of a wireless communication system, for example, a wireless local area network (WLAN) communication system and/or in any other unit and/or device. Units of a WLAN communication system intended to be included within the scope of the present invention include, by way of example only, modems, mobile units (MU), access points (AP), wireless transmitters/receivers, and the like.

[0013] Devices, systems and methods incorporating aspects of embodiments of the invention are also suitable for computer communication network applications, for example, intranet and Internet applications. Embodiments of the invention may be implemented in conjunction with hardware and/or software adapted to interact with a computer communication network, for example, a LAN, wide area network (WAN), a personal area network (PAN), or a global communication network, for example, the Internet.

[0014] Types of WLAN communication systems intended to be within the scope of the present invention include, although are not limited to, WLAN communication systems as described by "IEEE-Std 802.11, 1999 Edition (ISO/IEC 8802-11: 1999)" standard ("the 802.11 standard"), and more particularly in "International Standard ISO/IEC 8802-

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