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**Sherman**

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(54) **METHOD FOR ENABLING INTEROPERABILITY BETWEEN DATA TRANSMISSION SYSTEMS CONFORMING TO IEEE 802.11 AND HIPERLAN STANDARDS**

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(51) **Int. Cl.**
***H04J 3/00*** (2006.01)

(52) **U.S. Cl.** ..... **370/321**; 370/337; 370/341; 370/347; 370/442; 370/458; 370/462; 455/450

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See application file for complete search history.

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(57) **ABSTRACT**

Mechanisms, in a transmission channel shared by 802.11 systems and HIPERLAN/2 systems are provided to prevent 802.11 terminals from transmitting during time periods allocated to HIPERLAN, so that a single channel can be shared between the two standards. In a particular embodiment, a "super frame" format is used where HIPERLAN transmissions are offered the highest level of protection possible within 802.11, which is needed within the 802.11 Contention Free Period (CFP).

**15 Claims, 2 Drawing Sheets**

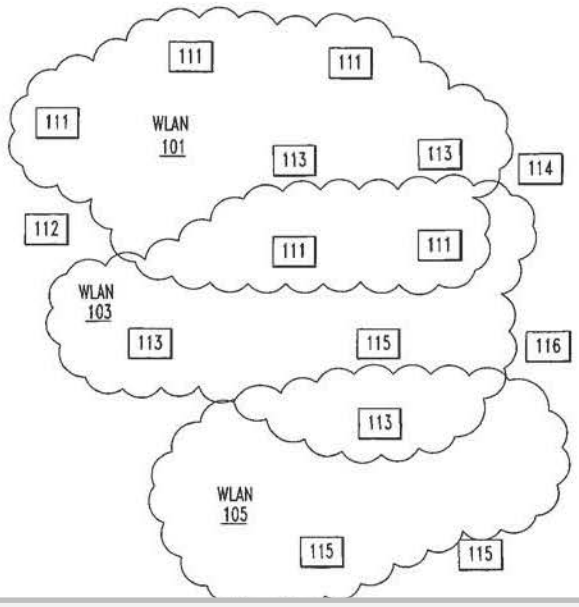

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*Fig. 1*

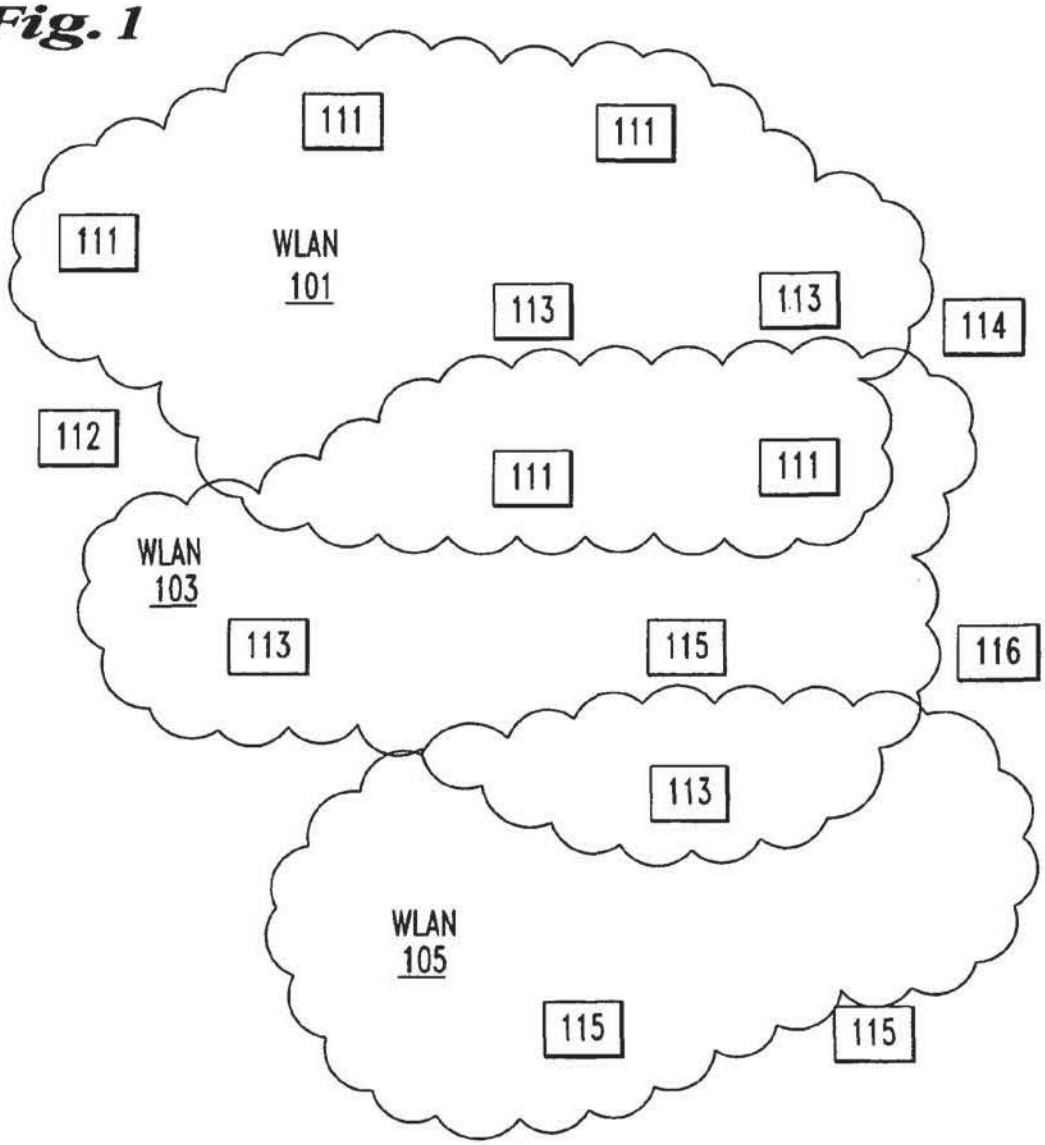



*Fig. 2*

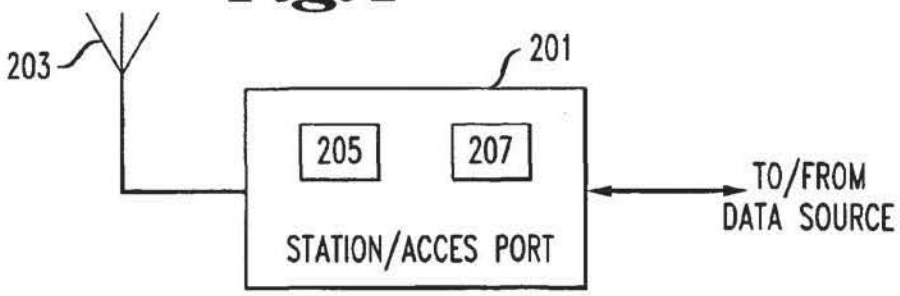


*Fig. 3*

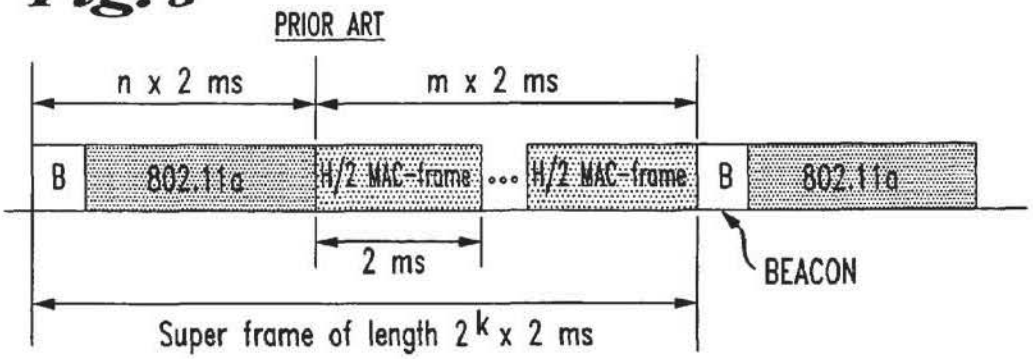



*Fig. 4*

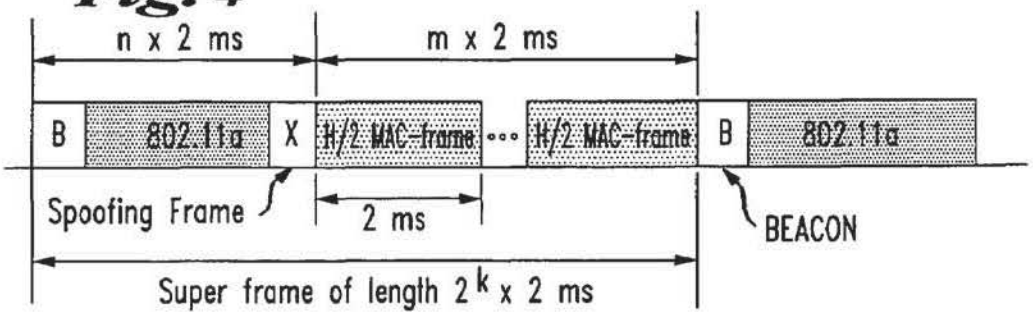
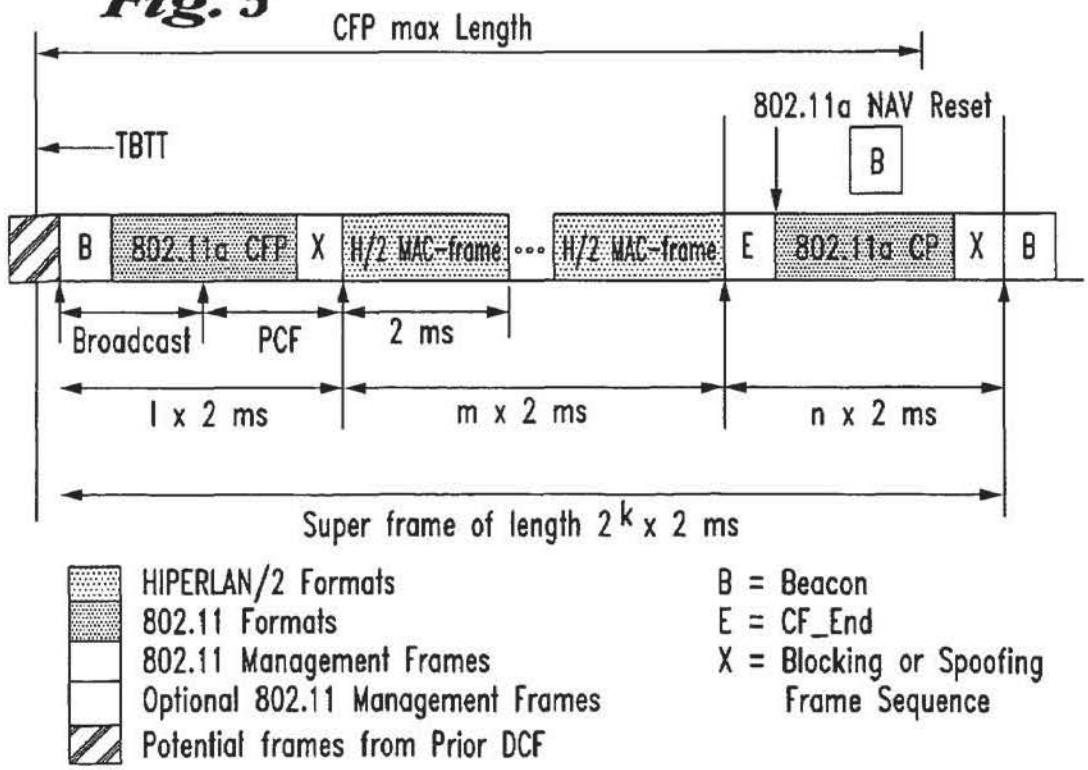



*Fig. 5*



# METHOD FOR ENABLING INTEROPERABILITY BETWEEN DATA TRANSMISSION SYSTEMS CONFORMING TO IEEE 802.11 AND HIPERLAN STANDARDS

This application claims priority of provisional application No. 60/261,935 filed Jan. 16, 2001.

## FIELD OF THE INVENTION

This invention relates to data transmission systems and to their controlling operating standards. It is also concerned with wireless local area networks (WLAN) and with allowing operability between two standards and in particular to interoperability between 802.11a standards and HIPERLAN standards.

## BACKGROUND OF THE INVENTION

Wireless data transmission is a rapidly growing field. One increasingly popular form of such transmission is wireless local areas networks (WLANs). A number of standards currently exist for WLANs. However, they tend to be fragmented and largely incompatible. There is a desire for a worldwide standard that would allow a single device to function virtually anywhere in the world providing high-speed connectivity.

WLANs require specific protocols to transmit information, as do wired LANs. With numerous stations along a network, LAN stations must take care to prevent collisions if more than one station wishes to transmit information in the LAN. The situation is more critical in the wireless environment (i.e., WLANs) since wireless stations and wireless access points behave differently from wired stations.

Recently, bands have opened up between 5 and 6 GHz, which may permit a worldwide standard. Wireless standards are being developed to utilize those bands. One such standard is HIPERLAN/2 (High Performance Radio Local Area Network Type 2), which is of European origin. Another such standard is IEEE 802.11a, which originates primarily in the US. Japan is developing standards similar to both those in the US and Europe. Both the US and European standards profess similar levels of performance, and use very similar waveforms to communicate. However, the two standards are currently incompatible—Particularly at the Media Access Control (MAC) layer. As such, a large push has developed to create a single hybrid standard, or provide some means for the two standards to easily interoperate.

Many situations occur where 802.11a WLANs must substantially coexist with HIPERLAN WLANs. Since they operate at overlapping frequencies, contention collisions are frequent and must be resolved if the two systems are to operate without interference in close proximity to each other.

Methods for interoperation of HIPERLAN and 802.11a systems are being contemplated in which systems conforming to both standards might share one common channel without interference. A super-frame structure has been proposed to support interoperation between the standards. The proposed structure contemplates a super frame with an 802.11 phase and a HIPERLAN/2 phase (See super-frame structure shown in FIG. **3**). The super frame has a length of 2k×2 ms, where k is an integer. Duration of the 802.11 beacon plus the 802.11a phase is set at n×2 ms. The



This method of facilitating interoperability of HIPERLAN and 802.11a has some drawbacks. For one, this approach presumes that the 802.11 terminals can be prevented from transmitting during the HIPERLAN operating phase. Currently, no mechanism exists within the 802.11 standard to allow this. Also, the problem is best addressed by a solution compatible with existing generations of terminals.

## SUMMARY OF THE INVENTION

Mechanisms, in a transmission channel shared by 802.11 systems and HIPERLAN/2 systems are provided in accord with the invention to prevent 802.11 terminals from transmitting during time periods allocated to HIPERLAN, so that a single channel can be shared between the two standards. In a particular embodiment, a "super-frame" format is used where HIPERLAN transmissions are offered the highest level of protection possible within 802.11, which is provided within the 802.11 Contention Free Period (CFP).

## BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a schematic of WLAN systems where interoperability is desirable;

FIG. **2** is a block schematic of a wireless station or access point used in the WLANS;

FIG. **3** is a graph of transmission states in the channels of a WLAN in one previously proposed solution concerning interoperability;

FIG. **4** is a graph of a proposed superframe structure of a contention arrangement for permitting interoperability between 802.11a WLANS and HIPERLAN WLANS;

FIG. **5** is graph of an alternative proposed superframe structure of a contention arrangement for permitting interoperability between 802.11a WLANS and HIPERLAN WLANS.

## DETAILED DESCRIPTION

WLANs are essentially a wireless replication of a wired LAN and in many ways operated in substantially the same manner. There are important differences that must be accommodated. A wireless node is unable to listen while it is transmitting and wireless media are more likely to contain noise and interference than are wired media. Additionally some terminals remain hidden to other terminals even though both may access a particular network. Hidden terminals coupled with an inability of a transmitting terminal to listen may result in collisions as more than one terminal may transmit in the same time interval.

Standards have evolved to avoid such collisions in WLANs. 802.11 is one standard in use in North America and has probable use in Europe and other areas in the world. HIPERLAN is a similar standard for WLANs used in parts of Europe and potentially in North America. It is not unexpected that in some areas there may exist a need to interoperate 802.11 and HIPERLAN/2 systems. Both standards operate in a frequency range that is overlapping hence unless steps are taken to prevent collisions they will likely occur.

A typical WLAN arrangement is shown in the FIG. **1** wherein several WLANs **101**, **103** and **105** which may overlap are shown in close proximity to one another. Each WLAN includes a plurality of stations **111**, **113** and **115**

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