PORTABLE INSTRUMENT AND DOCKING STATION WITH DIVIDED UNIVERSAL SERIAL BUS COMMUNICATION DEVICE

BACKGROUND

Various techniques exist for transmitting data between electronic devices. One common technique is referred to as serial data communication. Serial communication typically involves the transmission of data in a data stream, one bit at a time. The data is typically transmitted across a single conductor at a specified baud rate with high and low voltage levels representing bits ("0" or "1") of the data stream. Some serial communication standards utilize start and stop bits to signal the beginning and end of each byte (8 bits) of data.

Another common technique is referred to as Universal Serial Bus (USB) data communication. USB is commonly used both to communicate data between electronic devices and also to supply power from one of the devices to the other. The USB data communication standards require the transmission of various messages back and forth between the electronic devices, and therefore require that such devices have increased processing capabilities than basic serial communication devices. As a result, an electronic device that utilizes USB data communication may be more expensive and complex than an electronic device that utilizes serial data communication.

SUMMARY

In general terms, this disclosure is directed to a USB communication device. In one possible configuration and by non-limiting example, the USB communication device is divided between a first portion arranged in a portable instrument, and a second portion arranged in a docking station.

One aspect is a docking station comprising: a housing having a receptacle formed therein, the receptacle sized and configured to receive and support at least a portion of a portable medical instrument and including electrical contacts arranged to electrical connect with the portable medical instrument, wherein the portable medical instrument includes a first portion of a USB communication device adapted to communicate in a serial data communication format; and a second portion of the USB communication device enclosed in the housing, the second portion comprising: a serial to USB converter arranged in the housing and electrically connected to the electrical contacts, wherein the serial to USB converter is arranged and configured to convert between the serial data communication format and a USB data communication format to facilitate communication between the portable medical instrument and a host device; and electronic circuitry that detects the electrical connection of the portable medical instrument with the electrical contacts and initiates the communication with the host device after detecting the electrical connection.

Another aspect is a portable medical instrument comprising: instrument electronics adapted to generate data associated with a physiological characteristic of an individual; and a first portion of a USB communication device, the first portion comprising: a processing device, the processing device programmed to generate messages in accordance with a USB data communication protocol, at least one of the messages including the data; and a serial communication device that receives the messages from the processing device and transmits the messages to a docking station in a non-USB serial data communication format.

A further aspect is a dockable instrument assembly including a divided universal serial bus (USB) communication device configured to communicate with a USB-enabled host device, the dockable instrument assembly comprising: a portable instrument comprising: instrument electronics operable to generate data to be communicated to the host device, the data being associated with a physiological characteristic of an individual; and a first portion of the divided USB communication device comprising a serial communication device, wherein the first portion is arranged and configured to receive the data from the instrument electronics and transmit the data in a serial format with the serial communication device; and a docking station comprising: a receptacle sized to receive at least a portion of the portable instrument therein; a second portion of the divided USB communication device, the second portion comprising a serial to USB converter arranged and configured to: detect when the portable instrument is inserted into the receptacle; after detecting insertion of the portable instrument into the receptacle, initiate communication with the host device; and facilitate communication between the portable instrument and the host device.

Yet another aspect is a method of communicating with a USB-enabled host device, the method comprising: monitoring for insertion of a portable medical instrument into a docking station; detecting the insertion of the portable medical instrument into the docking station, the portable medical instrument configured to communicate with the docking station through a non-USB data communication device in a non-USB format; after detecting the insertion of the portable medical instrument, initiating communication with the host device to alert the host device to an arrival of the portable medical instrument; and facilitating communication between the portable medical instrument and the host device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of an example USB communication system.

FIG. **2** is a schematic block diagram illustrating another example of the USB communication system shown in FIG. **1**, including a divided USB communication device.

FIG. **3** is a schematic illustrating an example of a first portion of the divided USB communication device, shown in FIG. **1**.

FIG. **4** is a schematic block diagram of an example of a second portion of the divided USB communication device, shown in FIG. **1**.

FIG. **5** is a schematic diagram illustrating an example implementation of the second portion of the divided USB communication device, shown in FIG. **4**.

FIG. **6** is a schematic block diagram of an example host device of the USB communication system shown in FIG. **1**.

FIG. **7** is a flow chart illustrating an example method of communicating with a USB-enabled host device.

FIG. **8** is a flow chart illustrating an example method of facilitating communication between a portable instrument and a host device.

FIG. **9** is a flow chart illustrating a method of terminating communication with a USB-enabled host device.

DETAILED DESCRIPTION

Various embodiments will be described in detail with reference to the drawings, wherein like reference numerals represent like parts and assemblies throughout the several views. Reference to various embodiments does not limit the scope of the claims attached hereto. Additionally, any examples set