Alphanumeric Keyboard with In-built Microphone

Field of the Invention

The present invention relates to a keyboard with at least one in-built microphone with an automatic function and preferably, but not exclusively, to such an alphanumeric keyboard that also has peripheral functionality.

Definitions

Throughout this specification reference to "alphanumeric" is to be taken as including any symbols that may be found on the keys of a computer keyboard including regional or national alphabets, scripts and symbols. For example, a so-called "western" keyboard may include the following alphanumeric keys:

alpha keys a to z;
numeric keys 0 to 9;
function keys including dedicated function keys such as, for example, F1 to F12, and such keys as Internet access keys;
instructional keys such as, for example, "Esc", "Enter", "Ctl", "Shift", "Tab", "Caps Lock", "Delete", "Insert", "Home", "Page Up", "Page Down", "End", "Num Lock";
cursor control keys;
and the "Shift" function of all of them.

Background to the Invention

Many alphanumeric keyboards for computers now have a digital data connection to the host computer. The digital data connection may be a USB connection or IEEE 1394, or other relevant system including wireless connections. In many instances this is to allow extra function keys on the keyboard to control audio functions of the host. The audio functions may be, for example, volume controls, play functions, and so forth. By use of the digital data connector these may be controlled from the keyboard.

Peripheral devices such as a mouse are often connected to the host by a wireless connection using a wireless hub, the wireless hub being connected to the host using a wired digital data connector. This means that if only the mouse is wireless,

from IBM Corp, and SmartMedia memory cards. The card reader may be additional to or as an alternative to the wireless data receiver.

For all aspects, the digital data connector may be a USB connector or an IEEE 1394 connector. The peripheral device may be a wireless mouse.

According to a further aspect there is provided an alphanumeric keyboard having a plurality of alphanumeric keys and including at least one built-in microphone. The at least one microphone is able to be operated in an automatic mode. In the automatic mode upon one of the alphanumeric keys being activated, the at least one microphone is deactivated for a predetermined period. The predetermined period is controllable by a timer. The further aspect may be additional to or as an alternative to one or more of the aspects described above.

The microphones may detect the key press and mute an audio component. Additionally or alternatively, the processor may be able to detect a scan code generated by a keyboard driver of the alphanumeric keyboard and to mute the audio line from the microphones to disable the at least one microphone for the predetermined period in response to the receipt of the scan code. The predetermined period may be in the range 10 milliseconds to 10 seconds. At the end of the predetermined period the processor may reactivate the at least one microphone by cancelling the mute function.

Upon the microphones detecting a further key stroke sound and/or the keyboard driver generating a further scan code as a result of a further activation of at least one of the alphanumeric keys, the timer may reset the predetermined period.

The audio component may be one of: an audio line, a digital amplifier, an analog audio component, and a digital audio component. There may also be a buffer to delay processing of signals to prevent key press sounds from being processed as desired audio inputs. Upon a key press sound being detected, the buffer may be purged and muting take place.

The alphanumeric keyboard may further include one or more of: noise cancellation; a radio frequency card reader as described above; echo cancellation; and a wireless data receiver as described above. There may be a plurality of microphones in a spaced-apart relationship in the alphanumeric keyboard.

There may also be provided a secondary rectifier between the secondary coil and the at least one battery for rectifying the secondary voltage.

The alphanumeric keyboard may have a recess in a side wall thereof sized and shaped to receive a front portion of the mouse. The recess may have a wall. The primary coil may be adjacent the wall. The secondary coil may be in the front portion of the mouse. The recess may have a shelf on which the mouse can rest.

The wall of the alphanumeric keyboard may be a side wall, the mouse having a mouse wall, the mouse wall being able to contact the side wall; the secondary coil being adjacent the mouse wall.

Alternatively, the wall may be a top surface of the alphanumeric keyboard, there being provided a docking station in the top surface; the primary coil being located under the docking station; the secondary coil being located above a base of the mouse.

Description of the Drawings

In order that the invention may be fully understood and readily put into practical effect there shall now be described by way of non-limitative example only preferred embodiments of the invention, the description being with reference to the accompanying illustrative drawings in which:

Figure 1 is an illustration of a computer system incorporating a keyboard according to a first aspect of the present invention;
Figure 2 is a top view of the keyboard of Figure 1;
Figure 3 is a front view of the keyboard of Figures 1 and 2;
Figure 4 is an illustration of the fascia of the card reader of Figure3;
Figure 5 is a flow chart for the operation of the microphones;
Figure 6 is an architecture diagram;
Figure 7 is a partial sectional view of a further embodiment, the section along the lines and in the direction of arrows 6-6 on Figure 2;
Figure 8 is a view corresponding to Figure 6 of a second form of the further embodiment;
Figure 9 is a view corresponding to Figure 6 of a third form of the further embodiment;

Figure 31 is a partial perspective view illustrating an alternative form of mouse with a variant of the keyboard of Figure 2;

Figure 32 is a partial side view of the mouse and keyboard of Figure 31 after engagement of the mouse with the keyboard;

Figure 33 is a partial perspective view corresponding to Figure 31 after engagement of the mouse with the keyboard;

Figure 34 is a partial perspective view illustrating a further alternative form of mouse with a further variant of the keyboard of Figure 2;

Figure 35 is a partial perspective view of the mouse of Figure 34 after engagement of the mouse with the keyboard;

Figure 36 is a partial side cross-sectional view corresponding to Figure 34 after engagement of the mouse with the keyboard; and

Figure 37 is a partial perspective view in cutaway of the mouse of Figure 34 after engagement with the keyboard.

Description of the Preferred Embodiment

To first refer to Figures 1, 2 and 3, there is shown a computer system including monitor **10**, host PC **12** and keyboard **14**. Keyboard **14** is shown connected to host PC **12** by a cable **16**. Alternatively, a wireless connection may be used. The wireless connection may be by any suitable system including, for example, Bluetooth, or any other radio frequency or infrared system.

Keyboard **14** may have built-in speakers **18**. Cable **16** is connected to keyboard **14** at one end, and has its other end at least one digital data connector **20**. It is preferred for there to be only one connector **20**. The connector **20** may be a USB connector or a IEEE 1394 connector, or other suitable digital data transfer connector. In the following description reference will be made to the use of a single USB connector for the sake of convenience.

As is shown in Figure 2, the keyboard **14** has a number of built-in functional components including built-in wireless receiver **22** for a peripheral device to be able to communicate with the host **12**. The peripheral device may be a wireless mouse **23**. In this way a separate wireless hub connected to the host **12** is not required and the keyboard **14** acts as the wireless hub. This also clears a cable

microphones 28 are in a top wall of the keyboard 14. However, one or more of them may be in a side wall of the keyboard 14.

A switch 30 is provided to control the operation of microphones 28. Switch 30 is preferably a physical switch because if a software switch was used it may be able to be remotely accessed and the microphones 28 activated. This may allow a remote person to record conversations in the room in which keyboard 14 is located. This may be a breach of security or a breach of privacy. The switch 30 may have a LED display to indicate the operational mode of switch 30. Preferably, the switch 30 is in a top wall of the keyboard 14, but it may be in a side wall, if desired or required.

When an alphanumeric key is pressed (100), the position of switch 30 is checked (102). The switch 30 preferably has three positions – ON, OFF and AUTO. OFF disables all microphones 28 (102). ON enables on all microphones 28 (104) and they remain enabled until the switch 30 is changed (106). If the switched 30 is moved to OFF (108), the activation of the microphones 28 ends (116). If the switch 30 is moved to auto (112) the microphones move to the auto mode (114). However, if desired or required, the switch 30 may have only two positions. These may be OFF and an ON position that corresponds directly to the AUTO position described above and below.

As shown in Figure 6, there is a processor 35 that controls the operation of microphones 28 in response to switch 30 and input from microphones 28. The processor 35 may be in the host 12 or, alternatively, may be in the keyboard 14. The processor 35 passes audio signals from microphones 28 to an audio system 36 along at least one audio line 37. The processor 35 has timer 39 that may be integral with processor 35 or may be separate. There may also be a buffer 38 that may be integral with processor 35 or separate. Preferably, buffer 38 is in keyboard 14 even if processor 35 is in host 12 .

The output of microphones 28 will be analog audio. To be able to be processed in a digital environment, the analog audio needs to be:

(i) converted to digital audio using an analog-to-digital converter in keyboard 14 and then sent over the digital data connection to a sound card in host 12. It can then be sent back to the keyboard 14 over the digital data connection; or

where there is both audio input and keyboard functions. In this way the microphones **28** do not detect the use of the alphanumeric keys of keyboard **14** and thus the audio system **36** does not record, playback , transmit or otherwise propagate the sounds of the keys.

By having more than one microphone **28**, it is possible to use an echo-cancelling feature such as, for example, the "Adaptive Echo Canceller" available from Infinior MicroSystems Co Ltd of Seoul, Korea; or "Acoustic Echo Canceller" available from NEC Electronics Corporation of Japan. Both of these systems are for a single microphone and speaker and thus it may be necessary to have a separate system for each microphone/speaker pair.

To now consider Figures 7 to 11, there is shown part of the keyboard **14** including apparatus for recharging batteries of the wireless mouse **23** by contactless induction charging.

The keyboard **14** has a wall **602**. This may be a front wall, side wall or rear wall. Located immediately adjacent the wall **602** is a primary coil **604**. Primary coil **604** receives power from digital data connector **20**. If digital data connector **20** is a USB connector, the power will be at 5V DC. This is inverted to AC using DC-AC inverter **606** and the AC power is applied to the primary coil **604**.

When wireless mouse **23** is brought into close proximity to primary coil **604**, a secondary coil **608** in mouse **23** moves to be within the magnetic field generated by primary coil **604**. Eddy currents will therefore be induced within secondary coil **608**. This generates an AC voltage across secondary coil **608**. This generated AC voltage is then rectified in an AD-DC rectifier **610** and used to recharge batteries **612** in mouse **23**. Rectifier **610** may also have a battery charging circuit (not shown). The battery charging circuit may be a separate component if desired.

Primary coil **604** may have a core **614** that may be hollow, or may have ferrite core **616** if desired or required.

Primary coil **604** may be arranged parallel to wall **602** for surface close coupled charging (Figure 7); perpendicular to wall **602** but not projecting through wall **602** for surface close coupled charging (Figure 8); perpendicular to wall **602** and with ferrite rod **616** projecting through wall **602** for surface interlock charging (Figure 9);

Figures 19 to 21 are a variation of Figures 7 to 10 in that primary coil **604** is immediately adjacent wall **602** – in this case a side wall of keyboard **14**. The secondary coil **608** is adjacent a side **630** of mouse **23**.

Figures 22 to 24 show the mouse **23** of Figures 12 to 14 with the docking station **40** of keyboard **14** where the rod **616** engages in recess **624**.

Figures 25 to 27 show mouse **23** of Figures 16 and 17 with the keyboard of Figure 2. Here the docking station **40** is recessed into keyboard **14**. Coils **604** and **608** operate as previously.

Figures 28 to 30 show the mouse **23** of Figures 19 and 20 with the keyboard **14** of Figure 2. Here the primary coil **604** is in the side **632** of keyboard **14**, and the secondary coil **608** is in the side **630** of mouse **23**. Bringing the two coils in close relationship enables recharging to take place. Preferably, the close relationship is offset so that an end of the secondary coil **608** is adjacent an end of the primary coil **604** with there being no overlap of primary coil **604** and secondary coil **608**.

Figures 31 to 33 show an alternative form of mouse **23** with a variant of the keyboard **14** of Figure 2. Here the secondary coil **608** is between the scroll wheel **634** and the front **636** of mouse **23**. The primary coil **604** is in the front/top surface **640** of a recess **638** in the side **632** of keyboard **14** and that is sized and shaped to receive the front portion **644** of mouse **23**. When the front portion of mouse **23** is fully inserted into recess **638**, the secondary coil **608** is brought into adjacent relationship with the primary coil **604** to enable recharging to take place.
Figures 34 to 37 show the mouse **23** of Figures 31 to 33 with a variation of the keyboard **14** of Figures 31 to 33. The only differences are that recess **638** is elevated up wall **632** to allow the addition of a small shelf **642** on which the mouse **23** can rest when its batteries are being recharged, or for transport. This also enables primary coil **604** to be wound around recess **638**, and thus for an enlarged secondary coil **608** to be in the front portion **644** of mouse **23**.

In all other respects, the apparatus and operation to recharge the batteries **612** of mouse **23** is the same.

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The claims:

1. An alphanumeric keyboard comprising:
   (a) a plurality of walls;
   (b) a digital data connector for connection with a host computer;
   (c) a built-in wireless data receiver for receiving wireless communication from a peripheral device, the wireless data receiver being able to communicate with the host computer using the digital data connector and being able to have power supplied to it from the host computer using the digital data connector;
   (d) one of the plurality of walls comprising a docking station for a wireless mouse;
   (e) the docking station comprising primary coil of a contactless induction recharger, the primary coil being able to have power supplied to it by the digital data connector; and
   (f) the peripheral device comprising a wireless mouse comprising a secondary coil of the recharger, the recharger being for the recharging of at least one rechargeable battery in the wireless mouse.

2. An alphanumeric keyboard as claimed in claim 1, wherein the digital data connector is selected from the group consisting of: USB and IEEE 1394.

3. An alphanumeric keyboard as claimed in claim 1 further comprising:
   (a) at least one in-built functional component for co-operating with at least one external component to enable data received from the at least one external component to be communicated to the host computer using the digital data connector;
   (b) the in-built functional component being able to have power supplied to it from the host computer using the digital data connector, the external component being external to both the host and the alphanumeric keyboard.

4. An alphanumeric keyboard as claimed in claim 1 wherein the at least one in-built functional component is selected from the group consisting of: a card reader, a wireless data receiver, and an audio circuit.

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5. An alphanumeric keyboard as claimed in claim 4, wherein the card reader is for non-volatile memory devices to be used in conjunction with the host computer for at least one of: data transfer, data storage, multimedia file playback, multimedia data transfer, and multimedia data storage.

6. An alphanumeric keyboard as claimed in claim 5, wherein the non-volatile memory devices are selected from the group consisting of: Flash memory cards, Secure Digital memory cards, Multi-Media Cards, Compact Flash cards, Memory Sticks, Memory Sticks Pro, Microdrives, and SmartMedia memory cards.

7. An alphanumeric keyboard claimed in claim 5, where the card reader comprises a radio frequency card reader.

8. An alphanumeric keyboard having a plurality of alphanumeric keys and including at least one built-in microphone able to be operated in an automatic mode; whereby upon at least one of the plurality of alphanumeric keys being activated, the at least one microphone is muted for a predetermined period, the predetermined period being controlled by a timer.

9. An alphanumeric keyboard as claimed in claim 8, wherein there are a plurality of microphones in a spaced-apart relationship in the alphanumeric keyboard.

10. An alphanumeric keyboard as claimed in claim 8, wherein there is provided a keyboard driver for generating a scan code resulting from the activation of the at least one of the alphanumeric keys, the scan code being able to be detected by the processor to enable the processor to mute an audio line from the at least one microphone and, at the end of the predetermined period, the processor enables the at least one microphone by cancelling the muting of the audio line.

11. An alphanumeric keyboard as claimed in claim 10, wherein upon the processor detecting a further scan code resulting from a further activation of at least one of the alphanumeric keys within the predetermined period, the timer resets the predetermined period.

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12. An alphanumeric keyboard as claimed in claim 8, wherein the at least one built-in microphone detects the activation of the at least one of the alphanumeric keys and mutes an audio component and, at the end of the predetermined period, the at least one microphone is enabled by cancelling the muting.

13. An alphanumeric keyboard as claimed in claim 12, wherein the audio component is selected from the group consisting of: an audio line, a digital amplifier, an analog audio component, and a digital audio component.

14. An alphanumeric keyboard as claimed in claim 12, wherein the alphanumeric keyboard has a buffer to delay processing of signals to prevent key press sounds from being processed as desired audio inputs.

15. An alphanumeric keyboard as claimed in claim 14, wherein upon a key press sound being detected, the buffer is purged and muting takes place.

16. An alphanumeric keyboard as claimed in claim 8, wherein the predetermined period is in the range 10 milliseconds to 10 seconds.

17. An alphanumeric keyboard as claimed in claim 12, wherein upon the at least one microphone detecting a further activation of at least one of the alphanumeric keys within the predetermined period, the timer resets the predetermined period.

18. An alphanumeric keyboard as claimed in claim 8, further comprising at least one selected from the group consisting of echo cancellation, and a switch to control the operation of the at least one microphone.

19. An alphanumeric keyboard as claimed in claim 18, wherein the switch is a physical switch and has an LED display to indicate an operational mode of the switch.

20. An alphanumeric keyboard as claimed in claim 8, further including a digital data connector for connection with a host computer, the alphanumeric keyboard having at least one in-built functional component for co-operating

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with at least one external component to enable data received from the at least one external component to be communicated to the host computer using the digital data connector; the at least one in-built functional component being able to have power supplied to it from the host computer using the digital data connector.

21. An alphanumeric keyboard as claimed in claim 20, wherein the at least one in-built functional component is selected from the group consisting of: a card reader, a wireless data receiver, and a primary coil of a recharger

22. An alphanumeric keyboard having a digital data connector for supplying received DC power to the keyboard, the keyboard comprising an inverter for converting the received DC power to a primary AC power of a primary frequency; a primary coil immediately adjacent a wall of the keyboard and being adapted to have applied to it the primary AC power; the primary coil being able to induce an eddy current in a secondary coil located within a wireless mouse when the secondary coil is brought into close proximity to the primary coil so as to generate a secondary voltage across the secondary coil to enable recharging of at least one battery in the wireless mouse by contactless induction charging.

23. An alphanumeric keyboard as claimed in claim 22, wherein at least one of the primary coil and the secondary coil has a hollow core.

24. An alphanumeric keyboard as claimed in claim 22, wherein the primary coil has a ferrite rod in the hollow core.

25. An alphanumeric keyboard as claimed in claim 24, wherein the primary coil is perpendicular to the wall, the ferrite rod projecting through the wall for surface interlock charging.

26. An alphanumeric keyboard as claimed in claim 22, wherein the primary coil is parallel to the wall for surface close coupled charging with the secondary coil having an end of the secondary coil adjacent an end of the primary coil with there being no overlap of primary coil and secondary coil.

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27. An alphanumeric keyboard as claimed in claim 22, wherein the primary frequency is above the audible range.

28. An alphanumeric keyboard as claimed in claim 27, wherein the primary frequency is in the range of from 20KHz to 25KHz.

29. An alphanumeric keyboard as claimed in claim 22, wherein the secondary voltage is converted to DC to enable the recharging.

30. An alphanumeric keyboard as claimed in claim 22, wherein the alphanumeric keyboard has a recess in a side wall thereof sized and shaped to receive a front portion of the mouse; the recess having a wall, the primary coil being adjacent the wall, and the secondary coil being in the front portion of the mouse.

31. An alphanumeric keyboard as claimed in claim 30, wherein the recess has a shelf on which the mouse can rest.

32. An alphanumeric keyboard as claimed in claim 22, wherein the wall of the alphanumeric keyboard is a side wall, the mouse having a mouse wall, the mouse wall being able to contact the side wall; the secondary coil being adjacent the mouse wall.

33. An alphanumeric keyboard as claimed in claim 22, wherein the wall is a top surface of the alphanumeric keyboard, there being provided a docking station in the top surface; the primary coil being located under the docking station; the secondary coil being located above a base of the mouse.

34. An alphanumeric keyboard having a digital data connector for connection with a host computer, the alphanumeric keyboard comprising at least one in-built functional component for co-operating with at least one external component to enable data received from the at least one external component to be communicated to the host computer using the digital data connector; and the in-built functional component is able to have power supplied to it from the host computer using the digital data connector, the external component being external to both the host and the alphanumeric keyboard; the alphanumeric keyboard also having a plurality of

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alphanumeric keys and including at least one built-in microphone able to be operated in an automatic mode; whereby upon at least one of the plurality of alphanumeric keys being activated, the at least one microphone is muted for a predetermined period, the predetermined period being controlled by a timer.

35. An alphanumeric keyboard having a digital data connector for connection with a host computer, the alphanumeric keyboard comprising at least one in-built functional component for co-operating with at least one external component to enable data received from the at least one external component to be communicated to the host computer using the digital data connector; and the in-built functional component is able to have power supplied to it from the host computer using the digital data connector, the external component being external to both the host and the alphanumeric keyboard; the alphanumeric keyboard also comprising an inverter for converting the supplied power to a primary AC power of a primary frequency; a primary coil immediately adjacent a wall of the keyboard and being adapted to have applied to it the primary AC power; the primary coil being able to induce an eddy current in a secondary coil located within a wireless mouse when the secondary coil is brought into close proximity to the primary coil so as to generate a secondary voltage across the secondary coil to enable recharging of at least one battery in the wireless mouse by contactless induction charging.

36. An alphanumeric keyboard having a digital data connector for connection with a host computer, the alphanumeric keyboard comprising at least one in-built functional component for co-operating with at least one external component to enable data received from the at least one external component to be communicated to the host computer using the digital data connector; and the in-built functional component is able to have power supplied to it from the host computer using the digital data connector, the external component being external to both the host and the alphanumeric keyboard; the alphanumeric keyboard also comprising a plurality of alphanumeric keys and including at least one built-in microphone able to be operated in an automatic mode; whereby upon at least one of the plurality of alphanumeric keys being activated, the at least one microphone is muted for a predetermined period, the predetermined period being

controlled by a timer; the alphanumeric keyboard further comprising an inverter for converting the supplied power to a primary AC power of a primary frequency; a primary coil immediately adjacent a wall of the keyboard and being adapted to have applied to it the primary AC power; the primary coil being able to induce an eddy current in a secondary coil located within a wireless mouse when the secondary coil is brought into close proximity to the primary coil so as to generate a secondary voltage across the secondary coil to enable recharging of at least one battery in the wireless mouse by contactless induction charging.