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(19) **United States**(12) **Patent Application Publication**(10) **Pub. No.: US 2002/0052548 A1****Hsu et al.**(43) **Pub. Date:****May 2, 2002**(54) **APPARATUS FOR HUMAN INTERFACES OF
AN ULTRASONIC DIAGNOSTIC SYSTEM****Publication Classification**(51) **Int. Cl.⁷** **A61B 8/00**(52) **U.S. Cl.** **600/437; 600/459**(76) Inventors: **E-Chang Hsu**, Hsinchu (TW);
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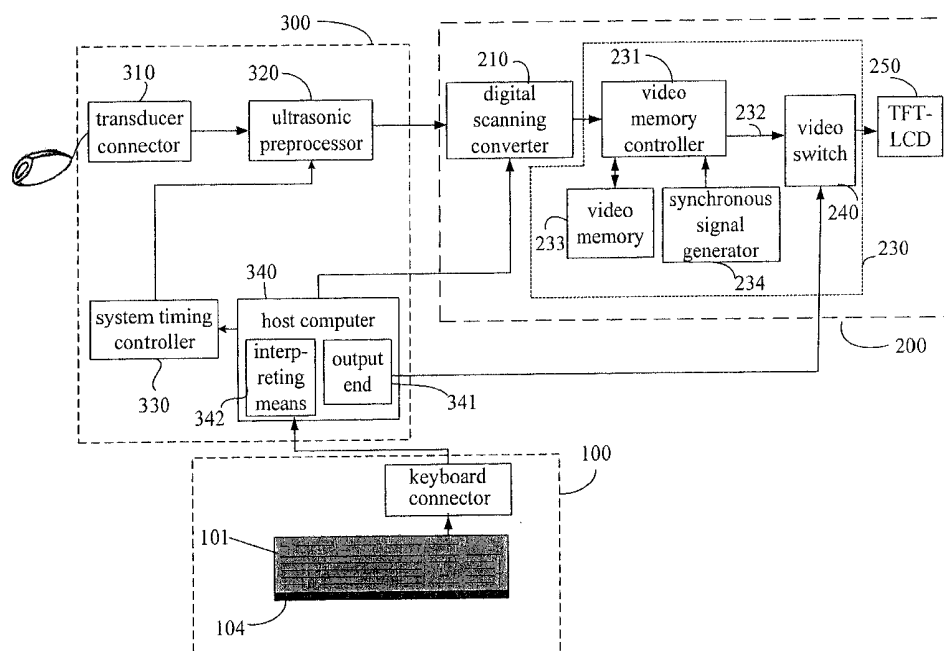
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ST LOUIS, MO 63102 (US)**(57) **ABSTRACT**

The present invention discloses an apparatus for human interfaces of an ultrasonic diagnostic system based on a personal computer. The apparatus can be applied in the input end and output end of the system. Only the normal keyboard of a personal computer is needed for the present invention, instead of further designing a customized control interface used in prior art. Besides, a digital display controller is used to control output signals of a scanner, which are stored in a video memory. The output frequency of the digital display controller is the same with that of the personal computer. Therefore, a lot of unnecessary transformations between different video signal formats seen usually in prior art can be avoided. Besides, system complexity and manufacturing cost will be reduced, and the power consumption will be also saved.

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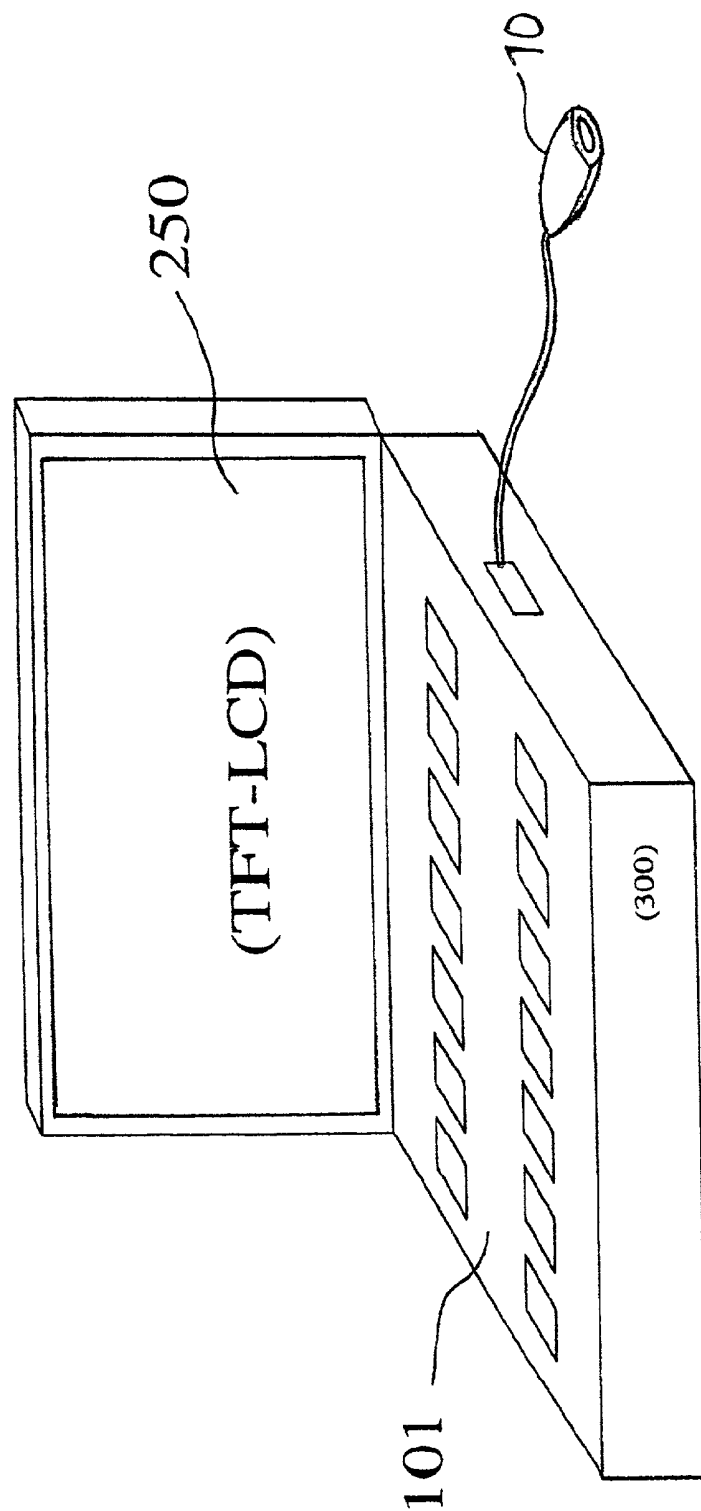


FIG. 1

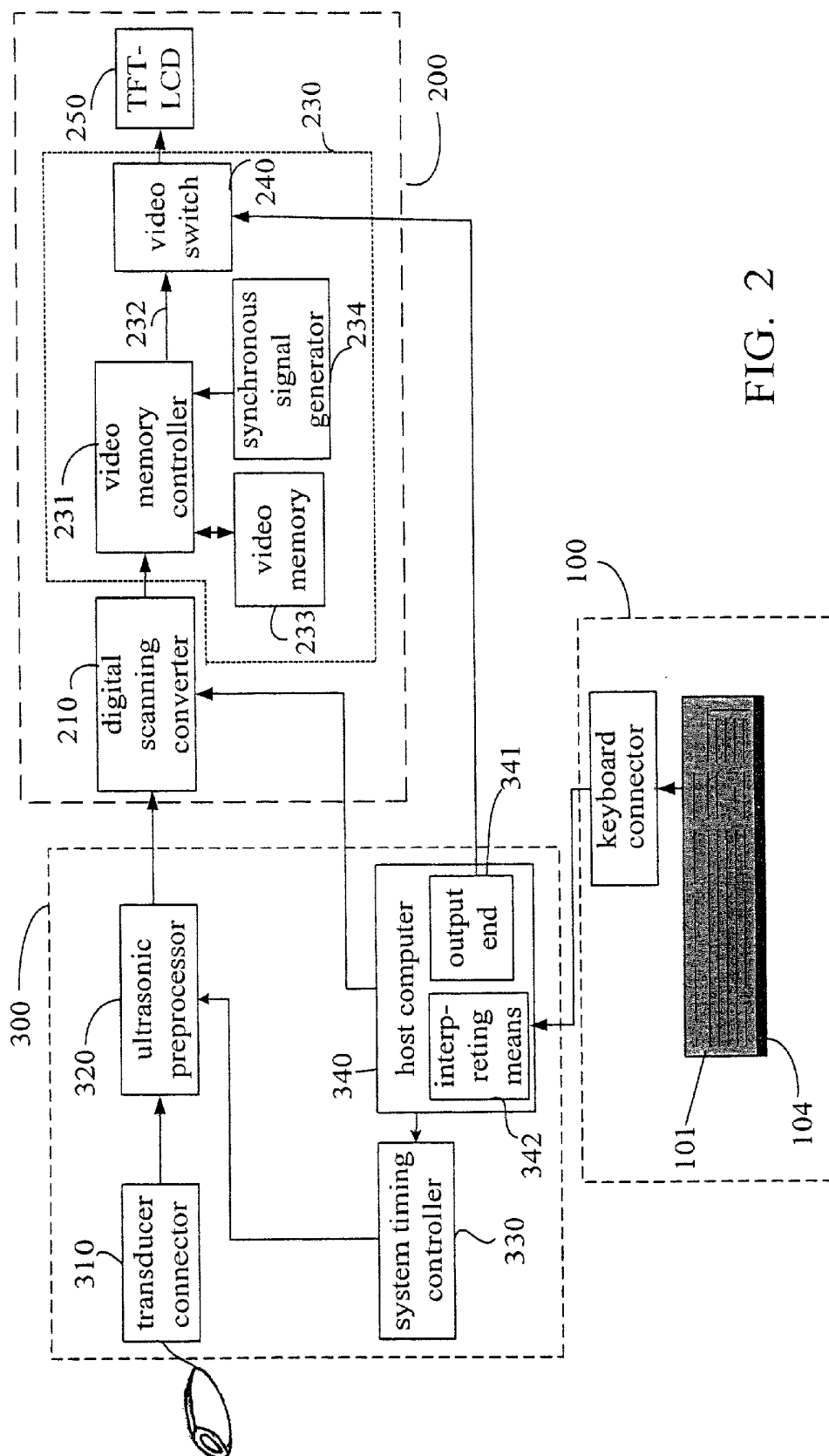


FIG. 2

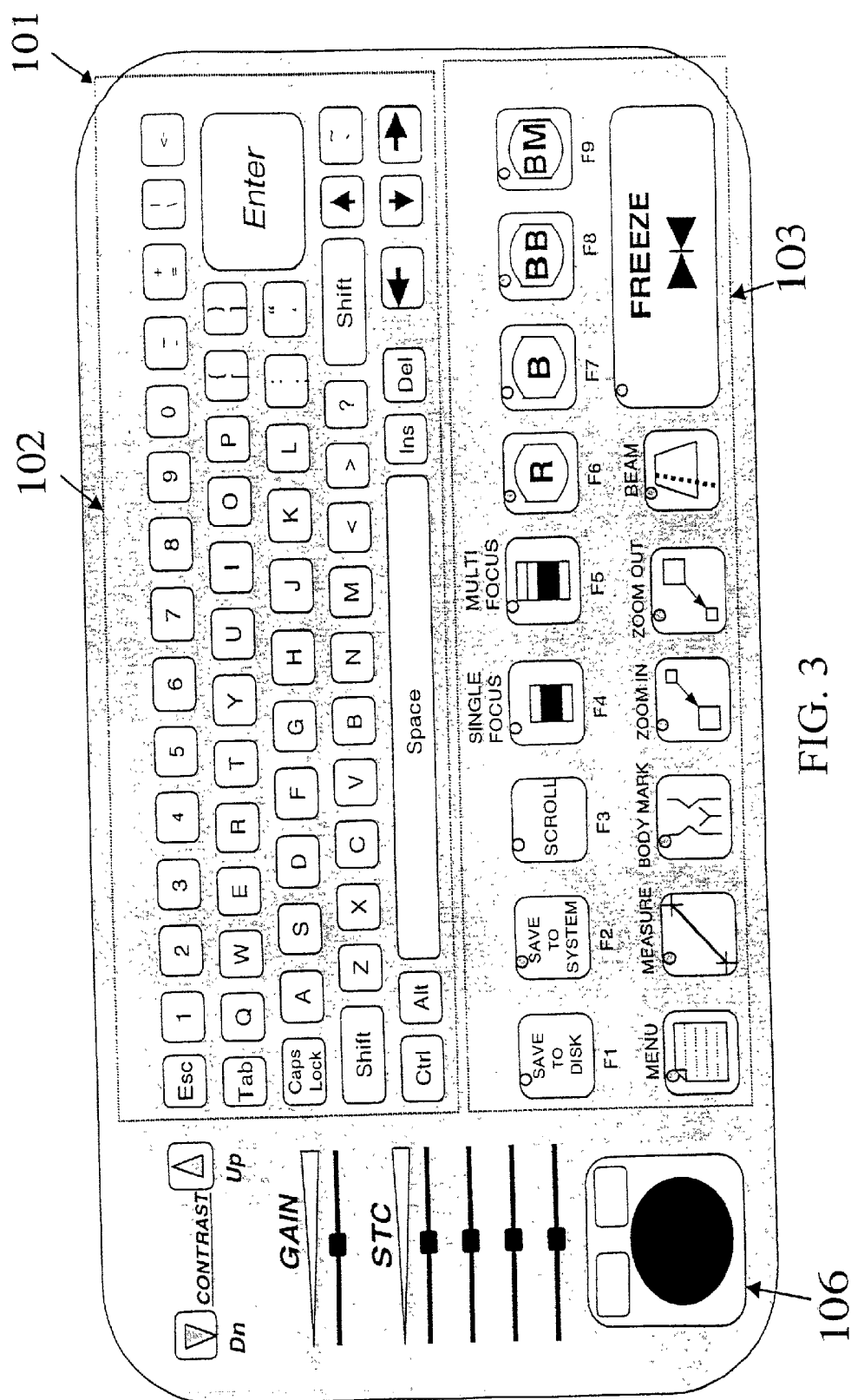


FIG. 3

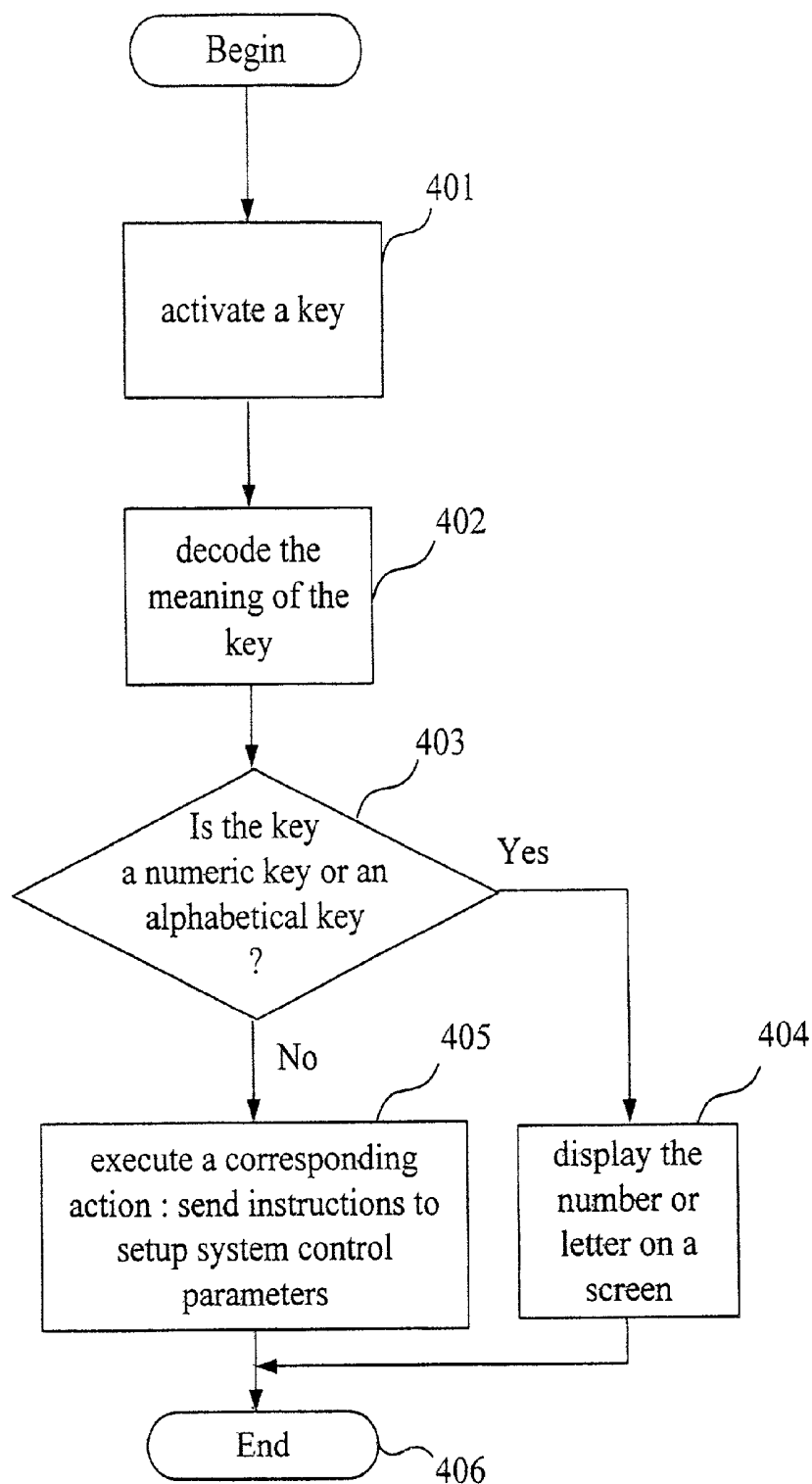


FIG. 4

APPARATUS FOR HUMAN INTERFACES OF AN ULTRASONIC DIAGNOSTIC SYSTEM

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to an apparatus for human interfaces of an ultrasonic diagnostic system, and particularly to an apparatus for human interfaces of an ultrasonic diagnostic system based on a personal computer.

[0003] 2. Description of the Related Art

[0004] The apparatus for human interfaces of an ultrasonic diagnostic system generally comprises: an input device such as a keyboard, tracking ball and mouse, a hard disk, and a monitor. Most ultrasonic diagnostic systems in the market have a customized circuit for controlling human interfaces, and storage formats of the ultrasonic diagnostic systems are mostly not the same.

[0005] Nowadays, personal computers are very popularly used in everywhere. If data regarding medical video signals can be accepted by a personal computer, the data processing will be very convenient. To meet this requirement, a few ultrasonic diagnostic systems in the market utilize a personal computer to control the data processing, and use a keyboard as a human interface. However, some special keys used by a doctor are not shown in a normal keyboard of a personal computer, and a customized panel portion and control interface are needed to be further provided to communicate with the personal computer. The above description is disclosed in U.S. Pat. No. 5,795,297. Besides, in displaying images, video capturing cards are needed to capture ultrasonic video signals from the output of the ultrasonic diagnostic system, and the ultrasonic video signals are then delivered to the monitor of the personal computer. The above description is disclosed in U.S. Pat. Nos. 6,015,385, 5,795,297 and 5,590,658, and also disclosed in WO 95/15521.

[0006] Unfortunately, video signals inside the ultrasonic diagnostic system are transmitted in a digital format, and before the video signals reach the output end, a digital-to-analog converter is needed to process for meeting requirements by a video capturing card, and an analog-to-digital converting is needed to process for meeting requirements by a personal computer. The prior art human interfaces will not only increase the power consumption of the system, but also increase design complexity and cost of the ultrasonic diagnostic system.

SUMMARY OF THE INVENTION

[0007] An object of the present invention is to provide an apparatus for human interfaces of an ultrasonic diagnostic system based on a personal computer to facilitate data processing and communication. The apparatus can be applied to an input end and output end of the ultrasonic diagnostic system.

[0008] To achieve the above object, the present invention is directed to an apparatus for human interfaces of an ultrasonic diagnostic system based on a personal computer, comprising an input data operation unit, a video display unit and a video capturing control unit. The video capturing control unit includes: a transducer connector for receiving ultrasonic feedback signals; an ultrasonic preprocessor for

outputting video signals in response to the ultrasonic feedback signals; a system timing controller for controlling the output of the video from the ultrasonic preprocessor; and a host computer for receiving instructions from the input data operation unit and controlling the system operation of the ultrasonic diagnostic system and message display of the video display unit. The input data operation unit includes: a panel portion having a plurality of input device for receiving commands from a user; and a circuit portion for transferring the commands to the host computer. The video display unit includes: a digital scanning converter for converging output video signals of the ultrasonic preprocessor into digital video signals; a video display controller for controlling the output of the digital video signals; and a digital display device for selectively displaying one of the digital video signals of the video display controller and digital data signals of the host computer.

[0009] By the above structure, only the normal keyboard of a personal computer is needed for the present invention, instead of further designing a customized control interface used in prior art. Besides, a digital display controller is used to control output signals of a scanner, which are stored in a video memory. The output frequency of the digital display controller is the same with that of a personal computer; therefore a lot of unnecessary transformation between different video formats seen usually in prior art can be avoided. Besides, the system complexity and manufacturing cost will be reduced, and the power consumption will be also saved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The invention will be described according to the appended drawings in which:

[0011] **FIG. 1** shows a perspective view of an apparatus for human interfaces of an ultrasonic diagnostic system according to the present invention;

[0012] **FIG. 2** shows a block diagram of the apparatus for human interfaces of an ultrasonic diagnostic system according to the present invention;

[0013] **FIG. 3** shows a panel portion of the present invention; and

[0014] **FIG. 4** shows a flow chart of the input data interpreting means of the present invention.

PREFERRED EMBODIMENT OF THE PRESENT INVENTION

[0015] The apparatus for human interfaces of an ultrasonic diagnostic system according to the present invention comprises an input data operation unit **100**, a video display unit **200** and a video capturing control unit **300**. **FIG. 1** shows a perspective view of the apparatus for human interfaces of an ultrasonic diagnostic system according to the present invention. In **FIG. 1**, a housing containing a video capturing control unit **300** therein, a panel portion **101** on a surface of the housing, a TFT-LCD **250** situated on the housing and an ultrasonic scanning head **10** connected to the video capturing control unit through a transducer are shown.

[0016] **FIG. 2** shows a block diagram of the apparatus for human interfaces of an ultrasonic diagnostic system according to the present invention. In **FIG. 2**, the apparatus for human interfaces of an ultrasonic diagnostic system accord-

ing to the present invention mainly comprises an input data operation unit **100**, a video display unit **200** and a video capturing control unit **300**.

[0017] The input data control unit **100** comprises a panel portion **101** for receiving commands from users and a circuit portion **104** for sensing the commands. The panel portion **101** will be shown in detail in FIG. 3. On the panel portion **101**, there are a lot of keys such as numeric keys, alphabetical keys **102** and function keys **103**, and a tracking ball **106** for inputting data and commands. The function keys are preferably located on a special position of the panel portion **101**, and marked as special keys of the ultrasonic diagnostic system.

[0018] The circuit portion **104** includes a connector and circuit arrangement compatible with a keyboard, a mouse or a joystick of a personal computer. Therefore, the input devices of a personal computer can be used, instead of increasing an interface unit. To meet a need of the ultrasonic diagnostic system, an input data interpreting means **342** for interpreting the commands from users is placed beside the panel portion **101** of the personal computer. Steps executed by the input data interpreting means **342** are shown in FIG. 4. First, a key is entered or activated in step **401**. In step **402**, the meaning of the keys being pressed is decoded. In step **403**, whether the received code is from numeric keys, alphabetical keys or function keys is determined. If the received code is from numeric keys or alphabetical keys, the entered number or letter is displayed on the screen **250** of the panel portion. If the received code is from function keys, then enter step **405**, execute a corresponding action and send out instructions to setup system control parameters. After that, the computer goes to an end to wait for another entry.

[0019] The video capturing control unit **300** includes: a transducer connector **310** for receiving ultrasonic feedback signals from a scanning head **10**; an ultrasonic preprocessor **320** for processing and determining the ultrasonic feedback signals and filtering possible noises; a system timing controller **330** for controlling the output of the ultrasonic preprocessor; and a host computer **340** for receiving instructions of the input data operation unit **100** which sets setting up parameters to control actions of the ultrasonic diagnostic system and message display of the video display unit **200**. In the host computer **340**, signals may be transmitted by a digital data output end to the video display unit **200**.

[0020] The video display unit **200** includes: a digital scanning converter **210** for converting output video signals for the ultrasonic preprocessor **320** into digital video signals; a video display controller **230** for controlling the output of the digital video signals; and a digital display device **250** for selectively displaying one of the digital video signals of the video display controller **230** and digital data signals of the host computer **340**. The digital display device **250** may be a device driven by digital control signals, such as a TFT-LCD display device. Therefore, the apparatus can be either used as a personal computer in a normal condition or used as an ultrasonic diagnostic system when connected to the scanning head **10**.

[0021] The video display controller **230** includes: a video memory **233** for storing digital video signals; a video memory controller **231** for receiving and storing the digital video signals into the video memory **233**; a synchronous signal generator **234** for generating at least one synchronous

signal which is provided to the video memory controller **231** for outputting the digital video signals; and a video switch **240** for optionally outputting one of the digital video signals of the video memory controller **231** and digital data signals of the host computer **340** to the digital display device **250** such as a TFT-LCD. Besides, the video switch **240** can be controlled by software, and the digital video signals outputted by the video memory controller **231** will be sent to the TFT-LCD **250** through a digital video cable **232**.

[0022] By the above structure, only an input data interpreting means is needed at input ends, such as a keyboard, instead of adding a special control interface. By the way, at output ends, there is no need to support a video capturing card, screen control card, and so on. In conclusion, the present invention supports an ultrasonic diagnostic system whose function is similar to a personal computer, and has a flexible utilization.

[0023] The above-described embodiments of the present invention are intended to be illustrated only. Numerous alternative embodiments may be devised by those skilled in the art without departing from the scope of the following claims.

What is claimed is:

1. An apparatus for human interfaces of an ultrasonic diagnostic system, comprising an input data operation unit, a video display unit and a video capturing control unit, wherein

said video capturing control unit includes: a transducer connector for receiving ultrasonic feedback signals; an ultrasonic preprocessor for outputting video signals in response to said ultrasonic feedback signals; a system timing controller for controlling the output of the video signals from said ultrasonic preprocessor; and a host computer for receiving instructions from said input data operation unit and controlling system operations of said ultrasonic diagnostic system and message display of said video display unit;

said input data operation unit includes: a panel portion having a plurality of input devices for receiving commands from a user; and a circuit portion having a connector and circuit arrangement compatible with the input devices for transferring the commands to said host computer; and

said video display unit includes: a digital scanning converter for converting the video signals of said ultrasonic preprocessor into digital video signals; a video display controller for controlling the output of said digital video signals; and a digital display device for selectively displaying one of the digital video signals of said video display controller and digital data signals of said host computer.

2. The apparatus for human interfaces of an ultrasonic diagnostic system of claim 1, wherein said host computer has an input data interpreting means for interpreting the commands transferred from said panel portion.

3. The apparatus for human interfaces of an ultrasonic diagnostic system of claim 1, wherein said video display controller has:

a video memory for storing the digital video signals;

- a video memory controller for receiving and storing said digital video signals into said video memory;
 - a synchronous signal generator for generating at least one synchronous signal which is provided to said video memory controller for outputting said digital video signals; and
 - a video switch for selectively outputting one of the digital video signals of said video memory controller and the digital data signals of said host computer to said digital display device.
4. An apparatus for human interfaces of an ultrasonic diagnostic system, said apparatus controlled by a host computer and outputting video signals from an ultrasonic preprocessor to function as an image output unit, comprising:
- a digital scanning converter for converting the output video signals of said ultrasonic preprocessor into digital video signals;
 - a video display controller for controlling the output of said digital video signals; and
 - a digital display device for selectively displaying one of the digital video signals of said video display controller and the digital data signals of said host computer.
5. The apparatus for human interfaces of an ultrasonic diagnostic system of claim 4, wherein said video display controller comprises:
- a video memory for storing digital video signals;
 - a video memory controller for receiving and storing said digital video signals into said video memory;
 - a synchronous signal generator for generating at least one synchronous signal which is provided to said video memory controller for outputting said digital video signals; and
 - a video switch for selectively outputting one of the digital video signals of said video display controller and digital data signals of said host computer to said digital display device.
6. An apparatus for human interfaces of an ultrasonic diagnostic system, said apparatus controlled by a host computer and functions as an input data operation unit, comprising:
- a panel including numeric keys, alphabetical keys and function keys for inputting data and commands;
 - a circuit portion for receiving said data and commands; and
 - an input data interpreting means for interpreting the data and commands transferred from said circuit portion and then sending to said host computer.

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摘要(译)

本发明公开了一种基于个人计算机的超声诊断系统的人机接口装置。该装置可以应用在系统的输入端和输出端。本发明仅需要个人计算机的普通键盘，而不是进一步设计现有技术中使用的定制控制接口。此外，数字显示控制器用于控制扫描仪的输出信号，其存储在视频存储器中。数字显示控制器的输出频率与个人计算机的输出频率相同。因此，可以避免在现有技术中常见的不同视频信号格式之间的许多不必要的变换。此外，还将降低系统复杂性和制造成本，并且还可以节省功耗。

