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(54) **MP3 PLAYER HAVING EXERCISE METER**

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(75) Inventors: **Wen-Hsiang Yueh**, Taipei County (TW); **His-Min Huang**, Taipei City (TW)

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Correspondence Address:
BACON & THOMAS, PLLC
625 SLATERS LANE
FOURTH FLOOR
ALEXANDRIA, VA 22314

(57) **ABSTRACT**

(73) Assignee: **YUEH, Wen-Hsiang**, Taipei County (TW)

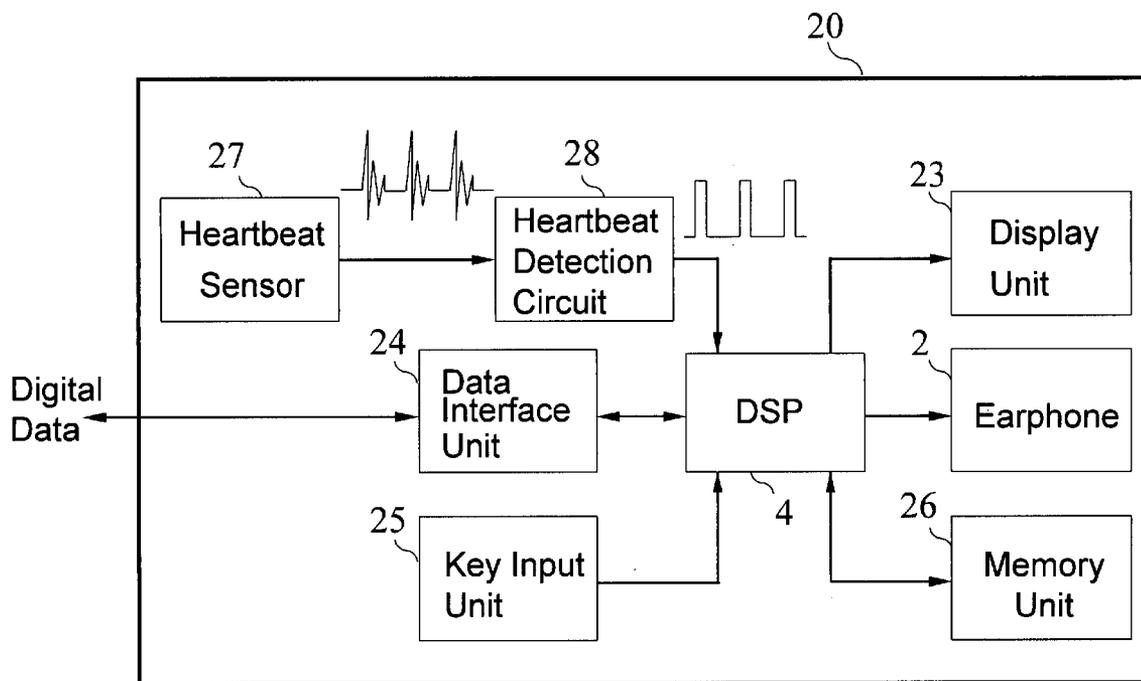
A MP3 player having an exercise meter is provided. The MP3 player includes a DSP processor for processing audio data and playing them; a vibration sensing component for generating a first signal following with a user's vibration and transmitting the first signal to the DSP processor; and a heartbeat sensor for sensing the heartbeat condition of the user to generate a second signal and transmit the second signal to the DSP processor. By using the DSP processor to process the first and the second signals to obtain the status of physical strength of the user, so that when the user carries the MP3 player for exercising, the MP3 player can play the music, and always monitor the exercising status of the user.

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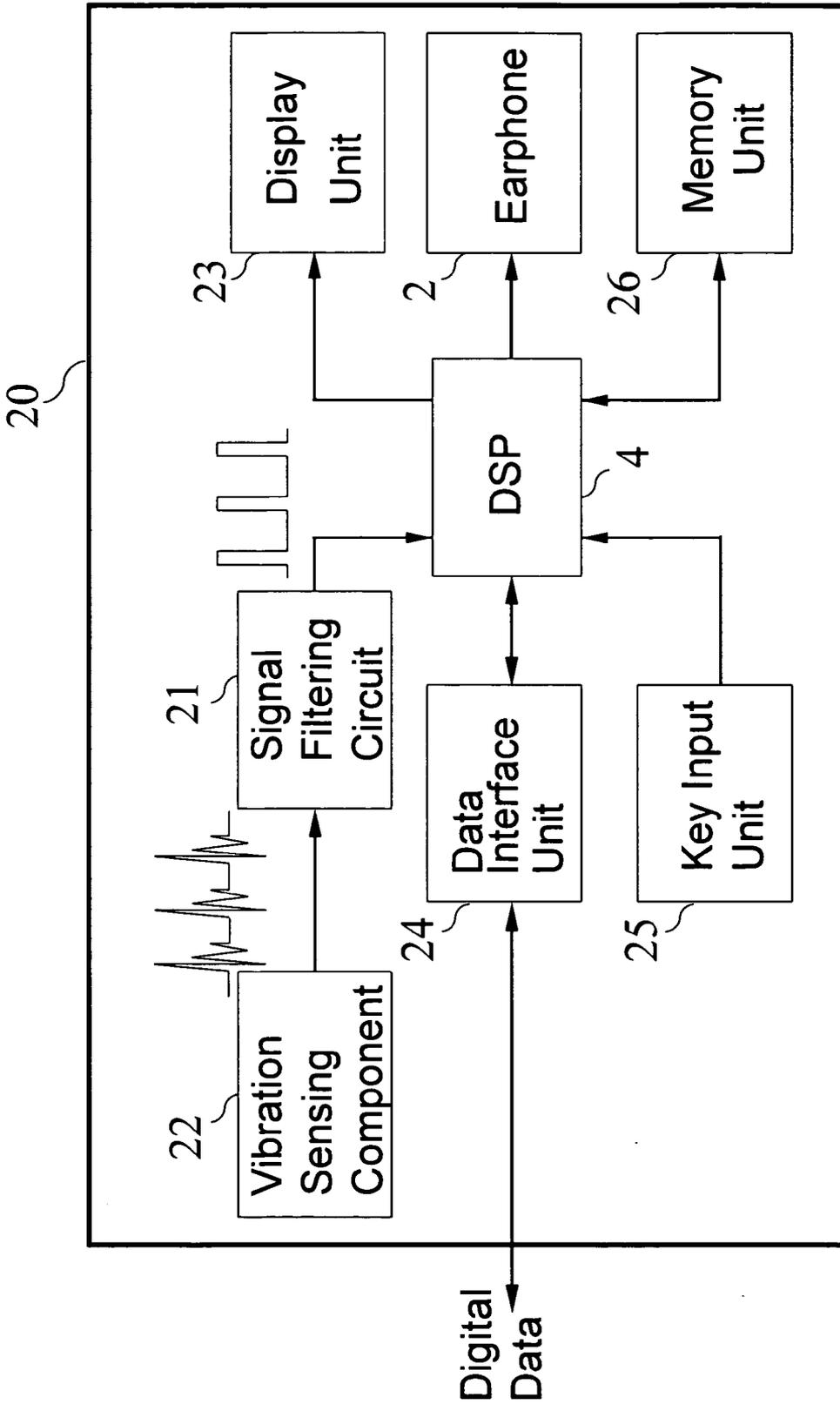


FIG. 1

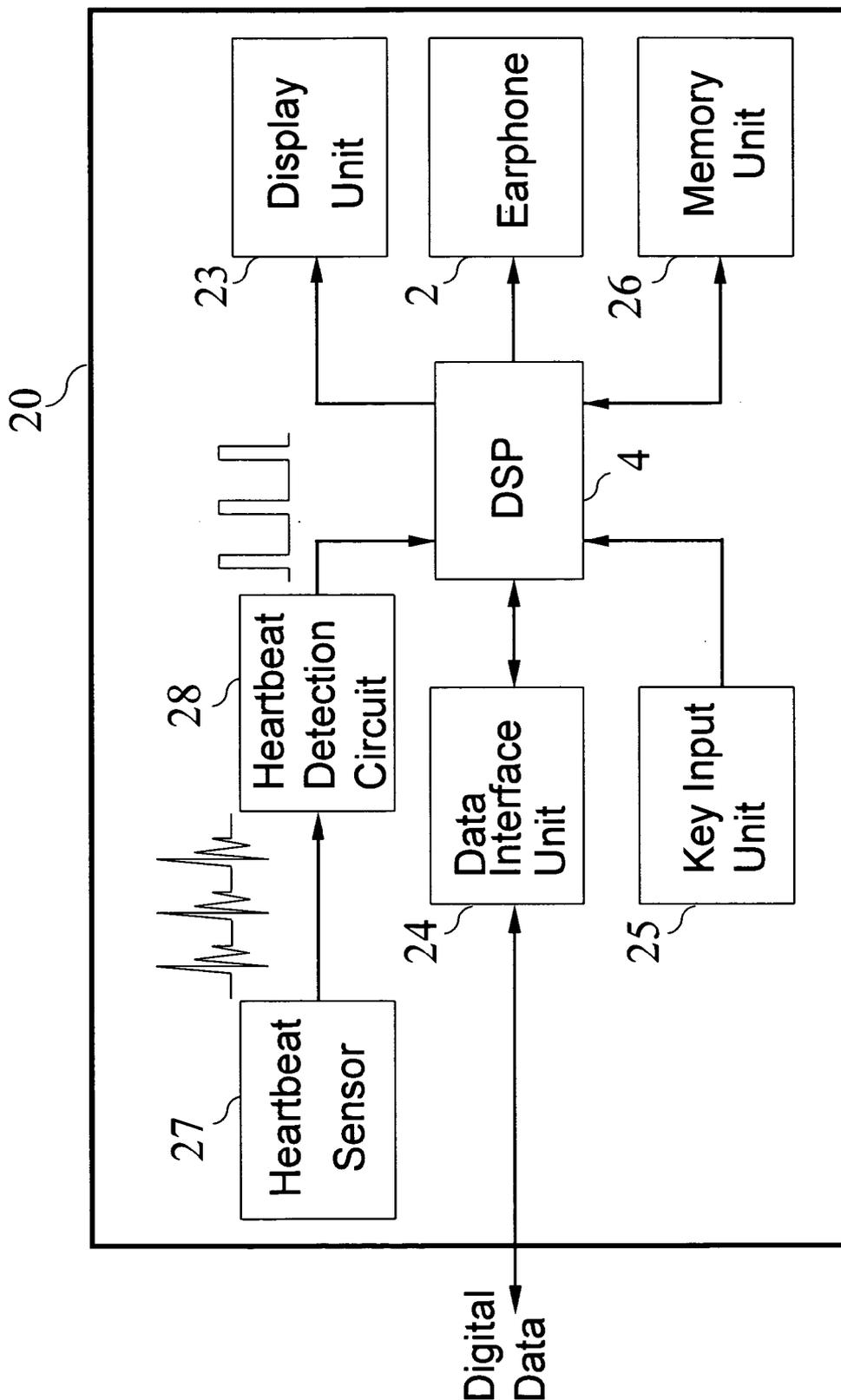


FIG. 2

MP3 PLAYER HAVING EXERCISE METER

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to an application of MP3 player, and more particularly to a MP3 player having an exercise meter, which can play the music and at the same time detect the exercise amount and pulse rate of the user.

[0003] 2. Description of the Related Art

[0004] In the prior art, the conventional audio players, such as MP3 player, CD player, can play music from the recording medium of compact disk, and provide the convenience for the user carrying with. Following with the increased functionalities, the new MP3 player product uses a repeatable read/write flash memory as the recording medium for the audio data. Except for the original music playing function, it also adds a data interface for updating the memory content as the user's data storage and a microphone interface for real-time recording the sound data as the user's recorder. Moreover, the music playing is not interrupted due to the affection caused by the user's vibration when using the flash memory as the recording medium for MP3 player. Thus, the sport enthusiasts often carry the MP3 players to enjoy both exercising and listening music.

[0005] Busy Modern life and diet habit have caused the danger to the people's health. So, it is necessary to have suitable exercise for the modern people. Normally, people will go to the gym or buy the running machine and other instruments for suitable exercising. But, because the busy life leads most people having no time for exercise, and no ideas about if it is enough for the exercising. Thus, there are some measuring meters in the market, for example the easy-to-carry pedometer, to provide the modern people calculating the daily exercise amount. However, in the prior art, the exercise meter and the MP3 player are in the same category of portable electronic products but not related application products developed. It is inconvenient for the sport enthusiasts needing to carry both products. Also, the conventional exercise meters only provide the real-time measuring display, but have no timing generator and memory for recording of the measuring data, which cannot provide the evaluation of the exercise amount over few days, one week or one month span.

SUMMARY OF THE INVENTION

[0006] Based on the related application products for exercise meter and MP3 player not developed in the prior art, the object of the present invention is to provide a MP3 player with the function of the exercise meter, which can detect the exercise amount of the user when playing music.

[0007] One object of the present invention is to provide a MP3 player with exercise meter for detecting the pulse rate of the user when playing music.

[0008] Another object of the present invention is to provide a MP3 player with exercise meter for recording the measuring data from exercise meter when playing music.

[0009] In a preferred embodiment according to the present invention, an audio player includes a memory unit for storing the compressed audio files; a DSP (Digital Signal Processing) processor for decoding the compressed audio

file to generate the audio signal in a playing operation; an earphone for converting the audio signal into the sound; and a key input unit for transmitting the command by user's request to the DSP processor; which is characterized in:

[0010] the audio player further includes a vibration sensing component, wherein the vibration sensing component will generate a first signal following with the user's vibration and transmit to the DSP processor. The voltage variation for the first signal caused by vibration is used as the input signal for stepping counts, and the stepping input signal will be used as the walking-step counting value through the processing and accumulation of the DSP processor;

[0011] wherein the audio player further includes a display unit, and the DSP processor can output the message for walking-step counting value on the display unit;

[0012] wherein the audio player further includes a timing generator, so that the DSP processor can record the exercising time based on the first signal;

[0013] wherein the DSP processor can obtain the personal information for the user, such as height, weight, and step span, by the key input unit, and record in the non-volatile memory unit. The DSP processor can calculate the information of calorie consumption or exercising distance according to the personal information and the walking-step counting value for each exercising metering, and display and make records.

[0014] In another embodiment according to the present invention, an audio player further includes a memory unit for storing the compressed audio file; a DSP processor for decoding the compressed audio file to generate the audio signal in a playing operation; an earphone for converting the audio signal into the sound; and a key input unit for transmitting the command by user's request to the DSP processor; which is characterized in:

[0015] the audio player 20 further includes a heartbeat sensor, and the heartbeat sensor detects the heartbeat status of the user, and generates a second signal and transmits to the DSP processor, and the second signal is in response to the pulsing of the user, and is processed and accumulated by the DSP processor to become the heartbeat value;

[0016] wherein the audio player further includes a display unit, and the DSP processor can output the message for the heartbeat value on the display unit.

[0017] The MP3 player according to the present invention has the function of exercise meter. During the playing of MP3 files, the MP3 player can simultaneously receive the signals detected by the vibration sensing component or the heartbeat sensor, then the detected signals are processed and accumulated; and the messages about physical capacity after conversion are displayed on the display. Thus, the user can be acknowledged about the exercise achievement during exercising and listening music, and evaluate the long-term exercise amount based on the records of each exercising, or output the measuring record data for usage.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] FIG. 1 is a block diagram of the MP3 player according to the first embodiment of the present invention.

[0019] FIG. 2 is a block diagram of the MP3 player according to the second embodiment of the present invention.

DETAILED DESCRIPTION OF THE
INVENTION

[0020] Although the present invention will be described in details with the attached figures from the preferred embodiments according to the present invention, the skilled artisan in the art should realize that they can modify the invention described in the application, and achieve the same effect as the present invention. Thus, it should be noted that the following description is only a broad disclosure to the skilled artisan in the art, and the contents should not be construed as the limitation to the present invention.

[0021] Firstly referring to **FIG. 1**, the figure is a block diagram for the first embodiment of a MP3 player according to the present invention. In the first embodiment according to the present invention, the MP3 player **20** includes a memory unit **26** for storing MP3 files or compressed audio files, and the memory unit **26** is a non-volatile memory device; a DSP processor **4** having the programmable digital signal processing capability, and the DSP processor **4** runs a program stored in the memory unit **26** to control the decoding of the MP3 files or compressed audio files during the playing operation for generating the corresponding audio signals; an earphone **2** for converting the audio signals outputted from the DSP processor **4** into the sound; a data interface unit **24**, which is an USB port for receiving the digital data from external MP3 files or compressed audio files, and storing into the memory unit **26** after the processing of the DSP processor **4**, or outputting the data stored in the memory unit **26** through USB ports; a display unit **23** connected with the DSP processor **4**, and the display unit **23** displays the messages outputted from the DSP processor **4**; and a key input unit **25** for transmitting a command by user's request to the DSP processor **4**, and the key input unit **25** includes a plurality of keys to generate the electric signals corresponding to the command by user's request to the DSP processor **4**.

[0022] The MP3 player **20** according to the first embodiment further includes a vibration sensing component **22** for generating a first signal following with the user's vibration; and a signal filtering circuit **21** connected between the vibration sensing component **22** and the DSP processor **4**. In the first embodiment according to the present invention, the first signal is in response to the user's vibration to generate the voltage variation, and the voltage variation is processed by the signal filtering circuit **21** as the step counting input signal. The step counting signal is transmitted to the DSP processor **4**, and processed and accumulated by the DSP processor **4** to obtain the measured walking-step counting value. The measured walking-step counting value is then displayed on the display unit **23**.

[0023] Furthermore, the DSP processor **4** can obtain the personal information of the user, such as height, weight, step span, from the key input unit **25**, and record in the non-volatile memory unit **26**. The DSP processor **4** can calculate the information of calorie consumption or exercising distance according to the personal information and the walking-step counting value for each exercising metering, and display and make records, and can also output the measuring record data for usage.

[0024] Referring to **FIG. 2**, it shows a block diagram of the second embodiment for the MP3 player according to the present invention. In the second embodiment according to

the present invention, the MP3 player **20** includes a memory unit **26** for storing the MP3 files or compressed audio files, and the memory unit **26** is a non-volatile memory device; a DSP processor **4** having the programmable digital signal processing capability, and the DSP processor **4** runs a program stored in the memory unit **26** to control the decoding of MP3 files or compressed audio files during the playing operation for generating the corresponding audio signals; an earphone **2** for converting the audio signals outputted from the DSP processor **4** into the sound; a data interface unit **24**, which is an USB port for receiving the digital data from external MP3 files or compressed audio files, and storing into the memory unit **26** after the processing of the DSP processor **4**, or outputting the data stored in the memory unit **26** through the USB port; a display unit **23** connected with the DSP processor **4**, and the display unit **23** displays the messages outputted from the DSP processor **4**; and a key input unit **25** for transmitting a command by user's request to the DSP processor **4**, and the key input unit **25** includes a plurality of keys to generate the electric signals corresponding to the command by user's request to the DSP processor **4**.

[0025] Further referring to **FIG. 2**, the MP3 player **20** further includes a heartbeat sensor **27** for detecting the heartbeat status of the user to generate a second signal; and a heartbeat detection circuit **28** connected between the heartbeat sensor **27** and the DSP processor **4**. In the second embodiment, the heartbeat sensor **27** is an infrared sensor or potential difference sensor, which can sense the heartbeat status of the user by the temperature variation and potential difference variation generated by the blood flow of the user. The second signal is in response to the pulsation of the user to generate a pulsing signal, and is transmitted to the DSP processor **4** after the processing by the heartbeat detection circuit **28**, and processed and accumulated by the DSP processor **4** to obtain the heartbeat value, and the measured heartbeat value is displayed on the display unit **23**.

[0026] Furthermore, the DSP processor **4** can real-time detect the continuous heartbeat status, so as to monitor the loading of the user's physical capacity status. The DSP processor **4** can analyze the heartbeat status indicated by the second signal, and when occurring the abnormal conditions, such as too fast the heartbeat, the DSP processor **4** can interrupt the music playing, and generate an alert audio signal to the earphone **2** to remind the user. Therefore, the MP3 player **20** can be used as a monitor for the user with potential heart disease.

[0027] According to the embodiments shown in **FIG. 1** and **FIG. 2**, the MP3 player **20** can also includes the vibration sensing component **22** and the heartbeat sensor **27**. The DSP processor **4** can execute the processing, analysis, and accumulating the first and the second signals according to a program stored in the memory unit **26**. During the conversion and processing, the DSP processor **4** can output messages to the display unit **23**, and the DSP processor **4** can switch to the selected operation mode based on the command transmitted from the key input unit **25**.

[0028] Furthermore, according to the embodiments shown in **FIG. 1** and **FIG. 2**, the MP3 player **20** further includes a timing generator connected to the DSP processor **4**. Except for providing the date and time, the DSP processor **4** can combine the timing information and the data generated for

each exercising, and record in the memory unit. The exercising metering in the MP3 player **20** according to the present invention can also be switching-on or switching-off by the operation of the key input unit **25**.

[0029] After the detailed descriptions of the preferred embodiments according to the present invention, the skilled artisan in the art can appreciate the various changes and modification without departing from the following claims and spirit. And, the present invention is also not limited to the implementation method of the embodiments of the present application. For example, the DSP processor in the MP3 player according to the present invention can further compute and process the detected signals and values to calculate the calorie consumption or fat burning index for the user.

What is claimed is:

1. A MP3 player, includes:
 - a memory unit for storing MP3 files;
 - a DSP processor for decoding the MP3 files to generate audio signals;
 - an earphone for converting the audio signals outputted from said DSP processor into sound signals;
 - a display unit for displaying the messages outputted from said DSP processor; and
 - a key input unit for transmitting a command by a user's request to said DSP processor;
 characterized in that:
 - said MP3 player further includes a vibration sensing component, which generates a first signal following with the user's vibration, and transmits the first signal to said DSP processor; and a heartbeat sensor for sensing the heartbeat status of the user to generate a second signal and transmit the second signal to said DSP processor, and said DSP processor processes and accumulates the first signal and the second signal respectively, obtains the walking-step counting values and the heartbeat counting values respectively, and displays the measured values on said display unit.
2. The MP3 player according to claim 1, further includes a signal filtering circuit connected between said vibration sensing component and said DSP processor.
3. The MP3 player according to claim 1, further includes a heartbeat detection circuit connected between said heartbeat sensor and said DSP processor.
4. The MP3 player according to claim 1, wherein said DSP processor obtains the personal information, such as height, weight and step span inputted by the user through said key input unit, and records in said memory unit, and said DSP processor calculates the information about calorie consumption or exercising distance based on the personal information and the walking-step counting value for each exercising metering, and displays and makes records.
5. The MP3 player according to claim 1, wherein said DSP processor executes the processing, analysis and accumulation on the first signal and the second signal based on a program stored in said memory unit.

6. An audio player, includes:
 - a memory unit for storing audio data;
 - a DSP processor for decoding the audio data to generate audio signals;
 - an earphone for converting the audio signals outputted from said DSP processor into sound signals;
 - a display unit for displaying the messages outputted from said DSP processor; and
 - a key input unit for transmitting a command by a user's request to said DSP processor;
 characterized in that:
 - said audio player further includes a vibration sensing component, which generates a first signal following with the user's vibration and transmits the first signal to said DSP processor, and said DSP processor processes and accumulates the first signals to obtain a walking-step counting value.
7. The audio player according to claim 6, wherein said DSP processor obtains the personal information, such as height, weight and step span inputted by the user through said key input unit, and records on said memory unit, and said DSP processor calculates the information about calorie consumption or exercising distance based on the personal information and the walking-step counting value for each exercising metering, and displays and makes records.
8. The audio player according to claim 6, wherein said DSP processor executes the processing, analysis and accumulation on the first signal based on a program stored in said memory unit.
9. The audio player according to claim 8, wherein the execution of said DSP processor for the processing, analysis and accumulation on the first signal is driven by the operation of said key input unit.
10. The audio player according to claim 6, further includes a data interface unit connected with said DSP processor, so that said DSP processor receives data or outputs measuring records through said data interface unit.
11. The audio player according to claim 6, further includes a timing generator connected with said DSP processor, so that said DSP processor combines the timing information and the data generated by each exercising, and records in said memory unit.
12. The audio player according to claim 6, wherein said DSP processor further computes and processes on the detected signals and values to calculate the calorie consumption or fat burning index for the user.
13. The audio player according to claim 6, wherein said DSP processor switches to the selected operation mode based on the command transmitted from said key input unit.
14. An audio player, includes:
 - a memory unit for storing audio data;
 - a DSP processor for decoding the audio data to generate audio signals;
 - an earphone for converting the audio signals outputted from said DSP processor into sound signals;
 - a display unit for displaying the messages outputted from said DSP processor; and

a key input unit for transmitting a command by a user's request to said DSP processor;

characterized in that:

said audio player further includes a heartbeat sensor for sensing the heartbeat status of the user to generate a second signal, and transmits the second signal to said DSP processor, and said DSP processor accumulates the second signal to obtain a heartbeat counting value.

15. The audio player according to claim 14, wherein said DSP processor obtains the personal information, such as height, weight and step span inputted by the user through said key input unit, and records on said memory unit, and said DSP processor calculates the information about calorie consumption or exercising distance based on the personal information and the walking-step counting value for each exercising metering, and displays and makes records.

16. The audio player according to claim 14, wherein said DSP processor executes the processing, analysis and accumulation on the second signal based on a program stored in said memory unit.

17. The audio player according to claim 16, wherein the execution of said DSP processor for the processing, analysis and accumulation on the second signal is driven by the operation of said key input unit.

18. The audio player according to claim 14, further includes a data interface unit connected with said DSP processor, so that said DSP processor receives data or outputs measuring records through said data interface unit.

19. The audio player according to claim 14, further includes a timing generator connected with said DSP processor, so that said DSP processor combines the timing information and the data generated by each exercising, and records in said memory unit.

20. The audio player according to claim 14, wherein said DSP processor further computes and processes on the

detected signals and values to calculate the calorie consumption or fat burning index for the user.

21. The audio player according to claim 14, wherein said DSP processor switches to the selected operation mode based on the command transmitted from said key input unit.

22. An audio player, includes:

a memory unit for storing audio data;

a DSP processor for decoding the audio data to generate audio signals;

an earphone for converting the audio signals outputted from said DSP processor into sound signals;

a display unit for displaying the messages outputted from said DSP processor; and

a key input unit for transmitting a command by a user's request to said DSP processor;

characterized in that:

said audio player further includes an exercise meter for sensing the physiological function of the user to generate responding electronic signals, and transmit the electronic signals to said DSP processor, and said DSP processor accumulates the electronic signals to obtain the user's exercise indices.

23. The audio player according to claim 22, wherein said exercise meter is a vibration sensing component.

24. The audio player according to claim 22, wherein said exercise meter is a heartbeat sensor.

25. The audio player according to claim 22, wherein the exercising indices include a walking-step counting value, a heartbeat value or calorie consumption.

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