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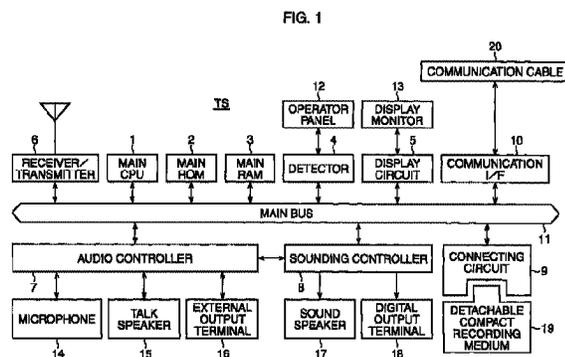
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## (54) Portable telephony apparatus with music tone generator

(57) A sound control apparatus is provided in a portable terminal for sounding a music tone in association with operation of the portable terminal, which is controlled by a main CPU. In the sound control apparatus, a memory memorizes music information representing a music tone and configuration information associated to a timbre of the music tone. An information acquiring section acquires the music information and the configuration information from the memory. A tone generating section is configured by the acquired configuration information to create a timbre specified by the configuration information. The tone generating section operates according to the acquired music information to generate the music tone being represented by the music information and having the specified timbre. A dedicated CPU is provided separately from the main CPU for controlling the memory, the information acquiring section and the tone generating section.



## BACKGROUND OF THE INVENTION

[0001] The present invention generally relates to a sounding control apparatus, and a portable terminal apparatus and a system that use this sounding control apparatus. More particularly, the present invention relates to sounding control apparatus built in a portable terminal apparatus such as a portable telephone terminal, and a base station having a database system for providing various pieces of information such as music information to this sounding control apparatus.

[0002] Recently developed portable telephone terminals have a capability of sounding a melodious ringing tone to notify call termination on them. This ringing melody is a sequence of monotones based on buzzer sound. The sound information for use in creating the melodious ringing tone can be downloaded from a base station for example.

[0003] However, melodious tone reproducing devices such as mentioned as for use in conventional portable telephone terminals can neither reproduce music that sounds two or more tones at a time nor allow various settings such as timbre and effect. Namely, the conventional melody tone reproducing devices cannot reproduce various kinds of music for user enjoyment.

## SUMMARY OF THE INVENTION

[0004] It is therefore a main object of the present invention to provide a sounding control apparatus that facilitates the setting, editing, and creating of music tone information such as timbre and effect for producing a melody sound at call termination or background music (BGM) during talking by sounding two or more tones at a time by use of an FM tone generator for example in a portable terminal device. So constituted, the sounding control apparatus according to the invention can realize the reproduction of rich and various sounds adapted to the processing capacity of portable terminals and user preferences.

[0005] It is another object of the present invention to provide a portable terminal apparatus that provides various operating modes in which audio and video signals are used along with reproduced tones for user enjoyment.

[0006] It is a further object of the present invention to provide a portable terminal apparatus that can provide a Karaoke play by synchronously treating music performance and words display.

[0007] It is a still further object of the present invention to provide a portable terminal apparatus, a music tone information service system and a base station, in which the portable terminal apparatus is capable of mounting a detachable recording medium that can realize various kinds of music data processing capabilities such as a change in tempo, automatic composition,

voice pitch detection, chord detection, style reproduction, format conversion of music information, and trial listening of music information.

[0008] In carrying out the invention and according to a first aspect thereof, there is provided a sounding control apparatus for use in a portable terminal apparatus capable of sounding a music tone, comprising: an information acquiring means or section for acquiring performance information and timbre-associated configuration information and effect-associated configuration information; given a timbre set on the basis of the timbre-associated configuration information, a tone generating means or section for generating a tone signal corresponding to the performance information; an effect imparting means or effector section for imparting an effect set on the basis of the effect-associated configuration information to the generated tone signal; and an output means or section for outputting the tone signal imparted with the effect.

[0009] In carrying out the invention and according to a second aspect thereof, there is provided a sounding control apparatus for use in a portable terminal apparatus capable of sounding a tone, comprising: a storage means or memory section for storing music tone information; a tone generating means for generating, on the basis of the music tone information stored in the storage means, a tone signal having a predetermined timbre and imparted with a predetermined effect; and a control means for controlling the storage means and the tone generating means independently of the portable terminal apparatus.

[0010] In carrying out the invention and according to a third aspect thereof, there is provided a portable terminal apparatus comprising: a storage means for storing music tone information, audio information, and video information; a sounding control apparatus for generating, on the basis of the music tone information stored in the storage means, a tone signal given with a predetermined timbre and/or a predetermined effect corresponding to configuration information included in the music tone information; and a means for generating, on the basis of the audio information and the video information stored in the storage means, an audio signal and a video signal. The music tone information stored in the storage means is presented in a format which is downsized as compared with a general-purpose music tone information format in correspondence with a storage size of the storage means.

[0011] In carrying out the invention and according to a fourth aspect thereof, there is provided a music tone information service system composed of a portable terminal apparatus capable of sounding a tone and a base station having a music tone information source, comprising: an information selecting means or section for selecting, according to selecting information sent from the portable terminal apparatus, corresponding music tone information from the music tone information source; configuration information attaching means or

section for attaching, to the selected music tone information, configuration information indicative of a timbre and an effect to be given to the tone sounded in the portable terminal apparatus; and a sounding control apparatus for generating, on the basis of the music tone information attached with the configuration information, a tone signal given with a predetermined timbre and/or a predetermined effect. This music tone information service system further comprising: a charging means or section for executing a charging operation on the portable terminal apparatus which sent the selecting information.

[0012] In carrying out the invention and according to a fifth aspect thereof, there is provided a music tone information service system composed of a portable terminal apparatus capable of sounding a tone and a music tone information processing apparatus capable of creating or editing music tone information, comprising: an information compressing means or section for compressing the created or edited music tone information; and a sounding control apparatus for generating, on the basis of the compressed music tone information, a tone signal given with a predetermined timbre and/or a predetermined effect.

[0013] In carrying out the invention and according to a sixth aspect thereof, there is provided a music tone information service system composed of a portable terminal apparatus capable of sounding a tone and a music tone information source which stores music tone information, comprising: an information acquiring or capturing means or section for acquiring or capturing the music tone information stored in the music tone information source into the portable terminal apparatus; an information editing means or section for editing the captured music tone information; and a sounding control apparatus for generating, on the basis of the edited music tone information, a tone signal given with a predetermined timbre and/or a predetermined effect.

[0014] In a seventh aspect of the invention, there is provided a portable terminal apparatus comprising a memory means for memorizing performance information and words information corresponding to progression of a performance, a tone generation control device operative based on the memorized performance information for sequentially generating a music tone signal, and a display means operative based on the memorized words information for generating a words display signal corresponding to the generated music tone signal. Further, there is provided a portable terminal apparatus comprising a memory means for memorizing first performance information, second performance information, and words information corresponding to performance progression of the second performance information, a tone generation control device operative based on the first performance information and the second performance information for generating a first music tone signal and a second music tone signal, respectively, a display means operative based on the words information for

generating a words display signal corresponding to the second music tone signal, and a control means for controlling the tone generation control device to generate the first music tone signal in precedence to generation of the second music tone signal.

[0015] According to the first aspect of the invention, a portable terminal apparatus capable of sounding tones has a sounding control apparatus that is given a timbre to be set on the basis of timbre-associated configuration information to generate a tone signal corresponding to performance information and to impart an effect to be set on the basis of effect-associated configuration information to the generated tone signal. Consequently, two or more tones can be sounded at a time by use of an FM tone generator for example, thereby providing rich and various ringing melodies, BGM during talking, and music at any time desired.

[0016] According to the second aspect of the invention, the control means (CPU), which operates independently of the portable terminal apparatus, is used to generate a tone signal having a predetermined timbre and imparted with a predetermined effect. Consequently, tone signal generation processing can be executed with relatively high degree of freedom without being restricted by the control of the portable terminal apparatus main.

[0017] According to the third aspect of the invention, a tone signal imparted with a predetermined timbre and/or effect corresponding to configuration information included in music tone information is generated on the basis of the music tone information and, at the same time, an audio signal and a video signal are generated on the basis of audio information and video information. Consequently, the user can enjoy the reproduced tone in various modes supported by the audio and video signals. In addition, according to the storage size of the storage means used, tone signals are generated by use of music tone information presented in a format which is downsized as compared with a general-purpose music tone information format. Consequently, quality tones can be reproduced within the maximum allowable range of the data processing and storage capacities of the portable terminal apparatus without weighing upon the memory of the apparatus.

[0018] According to the fourth aspect of the invention, a music tone information service system is formed by portable terminal apparatuses and the base station (server) having a music tone information source. According to the selection information sent from any of the portable terminal apparatus, the base station selects corresponding music tone information from the music tone information source. The base station creates configuration information indicative of a timbre and/or an effect to be imparted to a tone which is sounded in the portable terminal apparatus. On the basis of the music tone information attached with the created configuration information, the portable terminal apparatus generates a tone signal imparted with the

predetermined timbre and/or effect. Consequently, non- and divergent tones can be provided by effective use of the server database. In addition, the charging processing is executed to the portable terminal apparatus that sent the selection information, thereby providing appropriate services to the users of particular portable terminal apparatus.

[0019] According to the fifth aspect of the invention, music tone information is shared by a music tone information processing apparatus based on a personal computer or an intelligent electronic musical instrument. Music tone information of a desired format is created or edited in the music tone information processing apparatus to compress the created or edited music tone information into a size suitable for the portable terminal apparatus. Therefore, the novel constitution facilitates the setting, editing, and creation of timbres and effect of the music tone information suitable for the capacity of the portable terminal apparatus.

[0020] According to the sixth aspect of the invention, music tone information stored in music tone information sources such as external recording media and telephone terminals is captured in the portable terminal apparatus for editing. Consequently, music tone information of various forms can be processed into the music tone information suitable for the capacity of the portable terminal apparatus or user preferences.

[0021] To sum up, according to the present invention, a tone generator capable of sounding two or more tones at a time is arranged in a sounding control apparatus in a portable terminal apparatus to impart a timbre and an effect for example to a generated tone on the basis of configuration information associated with tone sounding. This novel constitution reproduces music, which is various in kind and rich in musicality as ringing melodies, BGM sounded during talking, and music, which entertains the user as desired. In the present invention, each piece of information including music tone information can be captured any time from external information sources such as base station, personal computer, other telephone terminals, and small-size or compact storage media, which enhances system extensibility, thereby reproducing a wide range of a variety of music as ringing melodies and BGM for example.

[0022] In addition, according to the present invention, the music information to be captured in the portable terminal apparatus is attached with configuration information associated with tone sounding, compressed by deleting unnecessary information so as to fit the storage size of the terminal apparatus, and format-converted so as to match in the own model of the terminal apparatus concerned, thereby enhancing system extensibility still further. Besides, use of an editing means facilitates the acquisition of the music tone information attached with configuration information while downsizing the amount of the information.

[0023] According to the seventh feature of the invention, the performance information and the words

information corresponding to progression of the music performance are memorized. The music tone signal is sequentially generated according to the performance information, while the words display signal corresponding to the generated music tone signal is generated according to the words information. Thus, the portable terminal apparatus such as a portable telephone can provide a Karaoke play. The inventive apparatus can be efficiently used for Karaoke training by displaying and memorizing Karaoke words in a spare time. According to this feature, there are treated first performance information, second performance information and words information corresponding to the performance progression of the second performance information. A second music tone signal is generated according to the second performance information, and a words display signal corresponding to the second music tone signal is generated according to the words information, thereby enabling Karaoke play. Further, the first music tone signal is generated according to the first performance information in precedence to the Karaoke play, thereby enabling automatic switch from the Karaoke play to the reproduction of a ringing melody according to the first music tone signal, while the words display may not disturb telephone conversation.

[0024] In addition, according to a specific aspect of the invention, being associated with editing performance information, there is provided a portable terminal apparatus that comprises a storage means for storing performance information, a means for displaying parameters in the performance information stored in the storage means, and a means for editing the parameters displayed. The portable terminal apparatus can display one of parameters in the stored performance information which the user wishes to edit, so that the user can operate ten keys for telephone number entry to input a parameter value, thus editing the performance information.

[0025] In carrying out the invention and according to an aspect of changing the tempo of music information, there is provided a portable terminal apparatus that comprises a storage means for storing music information, a tempo specifying means or section for specifying a tempo, and a control means for controlling, according to the tempo specified by the tempo specifying means, the tempo of a tone to be sounded on the basis of the music information stored in the storage means. The portable terminal apparatus allows the user to specify a tempo by use of at least one of parameters. The parameters include an absolute value of the tempo (a numerical value), a word indicative of the tempo (such as "allegro" and "moderato"), a rate of change from a reference tempo (% or  $\pm$ ), and an intuitive word ("quick", "slow" or "moderate"). Thus, the user can use an operator of the portable terminal apparatus (main unit) to specify a tempo so as to control the performance tempo of sounding music such as a ringing melody or BGM.

[0026] In carrying out the invention and according

to an aspect of automatic composition, there are provided a portable terminal apparatus that comprises a means for setting an atmosphere of music, and a means for automatically creating music information according to the set atmosphere, and another portable terminal apparatus that comprises a means for inputting a part of music data, and a means for automatically creating a whole of music information for a complete piece of music from the part of music data. The former terminal apparatus allows the user to use an operator to selectively set an atmosphere of music so as to automatically create music information. The latter terminal apparatus allows the user to input the part of music data so as to automatically create music information for a piece of music from the partial data.

[0027] In carrying out the invention and according to an aspect of pitch detection, there are provided a portable terminal apparatus that comprises a means for selectively acquiring either tone signals input from a microphone or tone signals received at a transmitting/receiving circuit, a means for extracting a pitch sequence from the acquired tone signals, and a means for creating music information on the basis of the pitch sequence extracted, and another portable terminal apparatus that comprises a means for acquiring a tone signal, and a means for extracting a pitch sequence from the acquired tone signals, a means for transposing the pitch sequence extracted, and a means for creating music information on the basis of the pitch sequence transposed. In these portable terminal apparatuses, when a pitch sequence is extracted from an input tone, the former terminal apparatus can arbitrarily select either a tone input from a microphone or a tone input during talking, while the latter terminal apparatus can transpose the detected pitch sequence as required.

[0028] In carrying out the invention and according to an aspect of chord detection, there is provided a portable terminal apparatus that comprises a storage means for storing music information, a music analyzing means for analyzing the music information stored in the storage means, and a means for automatically creating, on the basis of the analysis result by the music analyzing means, performance information associated with a chord fitting the music information. The portable terminal apparatus can automatically create performance information associated with the chord fitting the music information.

[0029] In carrying out the invention and according to an aspect of style reproduction, there is provided a portable terminal apparatus that comprises a storage means for storing plural kinds of style information, and a means for joining the style information stored in the storage means to create music information. The portable terminal apparatus can store plural kinds of style information and performance information and join them to reproduce a piece of music.

[0030] In carrying out the invention and according to an aspect of format conversion, there are provided a

portable terminal apparatus that performs a tone process using music information of a first format and a base station having a music tone information source, wherein the base station comprises a format converting means for converting music information of a format different from the first format into music information of the first format, and a base station capable of distributing music information from a music information source to a portable terminal apparatus that performs the tone process using music information of a first format, which comprises a format converting means for converting music information of a format different from the first format into music information of the first format. The music information service system and the base station can convert music information for other models or general-purpose music information incompatible with the first format into music information of the first format for its own model.

[0031] In carrying out the invention and according to another aspect of format conversion, there is provided a music tone information service system, composed of a portable terminal apparatus that performs a tone process using music information of predetermined format and a base station having a music tone information source, wherein the base station comprises a means for receiving identification information associated with the terminal apparatus from the portable terminal apparatus, and a means for creating, on the basis of the identification information received, the predetermined format of music information from the music tone information source, and a base station, capable of distributing music information from a music tone information source to a portable terminal apparatus that performs the tone process using music information of a predetermined format, which comprises a means for receiving identification information associated with the terminal apparatus from the portable terminal apparatus, and a means for creating music information of the predetermined format from the music tone information source on the basis of the received identification information. Upon transmission of the information associated with the terminal (identification information) from the terminal to the base station (server), the music tone information service system and the base station can perform format conversion at the base station on the basis of the information concerned.

[0032] In carrying out the invention and according to still another aspect of format conversion, there is provided a portable terminal apparatus that performs a tone process using music information of a predetermined format, the portable terminal apparatus comprising a format converting means for converting music information of a format into music information of a first format different from that before conversion. The portable terminal apparatus can perform format conversion in its own terminal apparatus from music information for other models or general-purpose music information incompatible with the first format into music information of the first format

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