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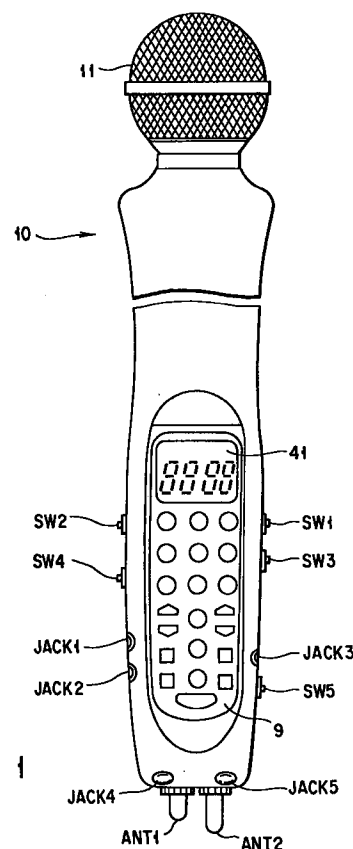
(72) Inventor: **Lee, Chae Woo**  
**Eunpyoung-ku Seoul (KR)**

(71) Applicants:  
• **MARUSHO CO. LTD.**  
**Shibuya-ku, Tokyo (JP)**  
• **TOWA CORPORATION**  
**Taito-ku, Tokyo (JP)**

(74) Representative:  
**Righetti, Giuseppe**  
**Bugnion S.p.A.**  
**Via Carlo Farini, 81**  
**20159 Milano (IT)**

(54) **Wireless accompaniment apparatus**

(57) All functions of an accompaniment apparatus are included in the body of a wireless microphone (10) to eliminate a necessity of using an individual, separated and special apparatus body. A background image, lyrics and an accompanying sound are transmitted to a television receiver or an FM radio receiver in a wireless manner. Only one microphone is required to permit a user to sing a song while watching the guide caption on the screen. As a result, the accompaniment apparatus can be used by any one at an arbitrary place regardless of the place being indoor or outdoor. Since a power amplifier for an earphone is provided, audio output through the earphone can be performed so that a user is able to perform a silent practice of singing and enjoy listening of other music.



**FIG. 1**

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## Description

The present invention relates a portable wireless accompaniment apparatus, and more particularly to a wireless accompaniment apparatus in which all functions of the accompaniment apparatus are included in the body of a microphone so that an individual external apparatus except the microphone is not required to transmit lyrics, accompanying sound (background sound) and the like to a television receiver or a radio receiver in a wireless manner.

In general, a conventional accompaniment apparatus, known as a "karaoke" machine, comprises a body of the apparatus and a microphone. The microphone is, in a wired or wireless manner, connected to the body of the apparatus. The body of the apparatus is connected to a display apparatus through a connection cable in a wired manner. The body of the apparatus includes a storage medium, such as an optical disk. The storage medium stores accompanying sound data and lyrics data for each tune. Data read from the storage medium and corresponding to a selected tune is, together with a vocal sound input through the microphone, transmitted from the body of the apparatus to the display device. Thus, the caption is displayed on the display apparatus, and the vocal sound with the accompanying sound is transmitted from a loudspeaker.

A "karaoke" machine must deal with a plurality of tunes and, thus, has a necessity of providing a storage medium having a large capacity. Therefore, the size of the body of the apparatus is in a trend of being enlarged. The enlargement of the size of the apparatus causes problems to arise in that the place in which the apparatus is installed is limited, the operation becomes too complicated and the cost cannot be reduced. Therefore, an apparatus of the foregoing type cannot substantially be used at home. Since the body of the apparatus and the display device are connected to each other in a wired manner, the apparatus cannot be used in an arbitrary place, such as in an automobile, that is, portability is unsatisfactory.

Accordingly, it is an object of the present invention to provide a wireless accompaniment apparatus exhibiting reduced size, light weight, low cost and satisfactory portability.

According to the present invention, a body of the apparatus capable of transmitting a background image signal, a lyrics signal and an accompanying sound signal is included in a wireless microphone. Therefore, only a conventional television receiver or radio receiver is required to play "karaoke" by using only one microphone without a necessity of using a special external apparatus individually separated from the wireless microphone. Therefore, a wireless accompaniment apparatus exhibiting reduced size, light weight, low cost and satisfactory portability can be provided.

This invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a front view of a wireless accompaniment apparatus according to a first embodiment of the present invention;

FIG. 2 is a block diagram showing a portion of an image, caption, and accompaniment control apparatus according to the first embodiment; and

FIG. 3 is a block diagram showing another portion of the image, caption, and accompaniment control apparatus according to the first embodiment.

A preferred embodiment of a wireless accompaniment apparatus according to the present invention will now be described with reference to the accompanying drawings.

FIG. 1 is a front view showing the portable wireless accompaniment apparatus according to a first embodiment. The accompaniment apparatus has a function of displaying a caption representing lyrics on a display while being accompanied with accompanying sound as well as mixing accompanying sound with a vocal sound. Although the caption may be displayed on a plain screen, the caption is, in this embodiment, displayed while being superimposed on a predetermined background image (although it is preferable that a kinetic image be employed, a still image may be employed) corresponding to the tune. It is to be noted that the present invention is not limited to the video-output accompaniment apparatus. The present invention may be applied to a simple accompaniment apparatus that does not output an image but only outputs an accompanying sound. If the accompaniment apparatus is able to output an image, it acts as an accompaniment apparatus for outputting only an accompaniment sound if a receiver is a radio receiver in place of the television receiver.

As shown in FIG. 1, the apparatus according to this embodiment has a shape of a conventional wireless microphone comprising a microphone 11 and a microphone body 10. The microphone body 10 is provided with a liquid crystal display device 41 for displaying the number indicating a tune, a state of reservation of tunes and a state of appointment, an operation panel 9 with which a selected tune is appointed, operation switches SW1 to SW5, connection terminals (jack switches) JACK1 to JACK5 and antennas ANT1 and ANT2.

The operation switch SW1 is a power source switch. The operation switch SW2 is a microphone switch for setting an operation mode, such as whether or not echo effect is used. The operation switch SW3 is a sound volume adjustment switch. The operation switch SW4 is a switch for switching the input/output of the jack switch JACK4 (to be described later). The operation switch SW5 is an earphone volume switch.

The jack switch JACK1 is a jack switch to which the earphone is connected. The jack switch JACK2 is an output jack switch to which a wired jack of an external audio apparatus is connected. The jack switch JACK3 is a jack switch to which a DC power source is connected. The jack switch JACK4 is an input/output jack switch to

which a wired jack of the external video apparatus is connected. The jack switch JACK5 is a jack switch to which an auxiliary microphone is connected.

The antenna ANT1 is an antenna for transmitting a video signal as a television signal. The antenna ANT2 is an antenna for transmitting an audio signal as an FM signal.

The microphone body 10, as shown in FIGS. 2 and 3, includes a video, caption, and accompaniment control unit. The video, caption, and accompaniment control unit is operated when a function button of the operation panel 9 provided at the microphone body 10 is operated so as to transmit a background image, lyrics and an accompanying sound to a television receiver, an FM radio receiver or the like.

A program memory (ROM) 21 for storing a control program for controlling the overall apparatus and various data is connected to an MPU (microprocessor unit) 22. The program memory 21 and the MPU 22 form a control unit 20. The control unit 20 is formed in one package or on one chip. The MPU 22 receives the program and data from the program memory 21 to perform a variety of control operations.

A video/audio control memory 30 is connected to the control unit 20. The video/audio control memory 30 comprises a program logic circuit 32 comprising an IC called TC3042; and a data memory (ROM) 31. The program logic circuit 32 and the data memory 31 are formed in one package or on one chip. Also the liquid crystal display (LCD) device 41 for displaying selection, reservation and appointment states of tune is connected to the program logic circuit 32. The program logic circuit 32 includes hundreds of various logic circuits so that internal circuits are connected in accordance with a user program so as to form one or a plurality of complicated logic circuits. The program logic circuit 32 does not include a program ROM. The data memory (external memory) 31 stores program data. Although the description has been made that the program logic circuit 32 uses an external ROM, the program logic circuit 32 may be changed to a mask type circuit or an order made type circuit including a ROM to reduce the cost and simplify the manufacturing process in a case where the program logic circuits 32 are mass-produced.

The video/audio control memory 30 reads background image data and lyrics data from the image/lyrics memory 40 in accordance with a command supplied from the operation panel 9 so as to supply read background image data and lyrics data to a video processor 70. The image/lyrics memory 40 comprises a semiconductor memory (ROM) which stores lyrics data of hundreds to thousands of tunes which is image data formed by lyrics superimposed on a background image. Moreover, the video/audio control memory 30 reads sound data (accompanying sound data) from a sound data memory 45 in accordance with a command supplied from the operation panel 9 so as to supply read sound data to a sound source circuit 50.

The sound source circuit 50 is controlled by the pro-

gram logic circuit 32 and comprises a MIDI (Music Instrument Digital Interface) interface 52, a digital signal processor 51, and a PCM (Pulse Coded Modulation) data memory 53. The sound source circuit 50 reproduces an accompanying sound signal (digital stereo sound signal) by using the PCM data supplied from the PCM data memory 53 in accordance with accompanying data read from the sound data memory 45 and supplies the reproduced signal to an audio mixer 80 through a D/A converter & pre-amplifier 55. Also the sound data memory 45 comprises a semiconductor memory (ROM) which stores accompanying data of hundreds to thousands of tunes. The MIDI interface 52 is a CPU interface under control of the MPU 22 so as to control all of the functions of the sound source circuit 50. The PCM data memory 53 stores PCM data.

The video processor 70 comprises a video data processor chip, a 256 KB video RAM for expanding compressed data and temporarily storing data, and a video signal synchronization separation circuit (each of which is omitted from illustration). The video processor 70 is controlled by the program logic circuit 32 which is controlled by the MPU 22 to read the background image data and the lyrics data from the image/lyrics memory 40, the read data being then transmitted to a video capture board 71 as a video signal formed of RGB signals and a synchronization signal. The video processor 70 is adaptable to both NTSC standard and the PAL standard. Also an external video input terminal (JACK4) 62 is connected to the video processor 70 so that a video signal is supplied from an external video apparatus, such as a video tape recorder, through an external video control circuit 61.

If no external video apparatus is connected to the external video input terminal 62, the video capture board 71 transmits, to an RF mixer 90, the RGB signal (the signal supplied from the image/lyrics memory 40) supplied from the video processor 70. As a result, a caption image for each tune (an image formed by lyrics of a tune superimposed on a background image) stored in the image/lyrics memory 40 is transmitted from the antenna ANT1. If an external video apparatus is connected to the external video input terminal 62, the video capture board 71 turns off the background image stored in the image/lyrics memory 40 and converts an external video signal (an NTSC signal) supplied from the external video apparatus into an RGB signal. As a result, the video capture board 71 uses the external image selected arbitrarily by a user so that a video signal is transmitted from the antenna ANT1 in such a manner that the lyrics are moved as the tune proceeds.

The video signal transmitted from the video capture board 71 is, in the RF mixer 90, mixed with the audio data transmitted from the audio mixer 80. A stereo audio signal transmitted from the audio mixer 80 is, in a monaural mixer 88, processed such that R and L channels are synthesized so as to be formed into a monaural voice signal, followed by being supplied to the RF mixer 90 through a modulator 89 of 4.5 MHz so as to be mixed

with the video signal. The video signal, transmitted from the RF mixer 90 and in the form in which the lyrics are superimposed on the background image, and a sound signal (monaural sound signal) indicating the accompanying sound are transmitted to a video receiving terminal unit, such as a television receiver or a monitor unit having a receiver from the TV transmission antenna ANT1 through an RF power amplifier 92 capable of multiplying the level by two times. The transmission frequency from the antenna ANT1 is set to a channel in which the television broadcasting wave is empty.

On the other hand, a vocal sound supplied through the microphone 11 is supplied to the audio mixer 80 through an equalizer amplifier & voice detector 60 and an echo system 81. Though the accompanying sound transmitted from the sound source circuit 50 is a stereo sound and the input vocal sound is a monaural sound, the accompanying sound is not converted into a monaural sound but the same is synthesized in the stereo state as it is in the audio mixer 80. Thus, the monaural vocal sound is synthesized with the R and L channel accompanying sounds. The audio mixer 80 synthesizes the vocal sound transmitted from the echo system 81 and the accompanying sound transmitted from the sound source circuit 50 with each other so as to transmit stereo sound signals R and L to a stereo modulator 84 and an earphone power amplifier 82. The output from the stereo modulator 84 is further transmitted to an audio receiver terminal unit, such as an FM radio receiver, from the FM transmission antenna ANT2 through the FM modulator 85, an RF amplifier 86 capable of amplifying the level by four times, and an RF amplifier 87 capable of amplifying the level by three times. The transmission frequency of the antenna ANT2 is set to an empty frequency of the FM radio broadcasting wave.

Also a microphone auxiliary jack (JACK5) is connected to the equalizer amplifier & voice detector 60 to enable duet to be enjoyed. The equalizer amplifier & voice detector 60 comprises an amplifier (an equalizer amplifier) for correcting the frequency characteristic and a voice detector. The voice detector detects whether or not voice exists in the input sound from the microphone 11 so as to supply voice data to the microprocessor 22. The microprocessor 22 subjects accompanying data and voice data to a comparison so as to calculate the score of the singing skill and display the score.

The operation of the present embodiment will now be described.

When a portable wireless accompaniment apparatus of the present embodiment is used by a user, the user holds the upper portion of the microphone body 10 with the hand, followed by switching the power switch SW1 on. Then, the microphone switch SW2 is brought to an echo microphone position, and then the volume adjustment switch SW3 is operated to appropriately adjust the synthesis ratio (the level) of the vocal sound input through the microphone and the accompanying sound. On the other hand, the output switch SW4 is

operated to select whether only an audio sound is enjoyed or whether only a video image is watched or whether both an audio sound and a video image are used. The foregoing selection is performed depending upon whether the wireless receiving terminal apparatus to be used with the apparatus according to the present invention is a television receiver or a radio receiver. When the output switch SW4 has been set to a position for both the television receiver/radio receiver, both the background image and the caption are displayed on the screen of the television receiver while the vocal sound and the accompanying sound being output from the speaker of the television receiver. Moreover, the vocal sound and the accompanying sound are simultaneously output through the speaker of the radio receiver.

When a user sings a song while holding the microphone 11, the user is enabled to easily and skillfully sing the song thanks to the guide caption and the accompanying sound. The level of the vocal sound supplied through the microphone 11 is automatically adjusted and amplified by the equalizer amplifier & voice detector 60. Moreover, the echo effect is given to the vocal sound through the echo system 81.

Note that tune selection is performed by using a switch disposed on the operation panel 9 of the microphone body 10. The name of the selected tune is displayed on the liquid crystal display 41 in the form of the corresponding number. After a tune has been selected by using the operation panel 9, the program logic circuit 32 transfers, to the sound source circuit 50 and the video processor 70, the background image data, lyrics data and accompanying sound data corresponding to the tune and selected from data of a plurality of tunes stored in the image/lyrics memory 40 and the sound data memory 45. The sound source circuit 50 converts the accompanying data into music sound so as to transmit the accompanying sound to the audio mixer 80. The video processor 70 transmits the background image and superimposes caption images on the background image to be adaptable to the progress of the music sound.

When a connection jack of the external audio apparatus is connected to the jack switch JACK1, supply of electric power to the FM transmission system (to the stereo modulator 84, the FM modulator 85, and the RF amplifiers 86 and 87) is interrupted so that the FM wireless transmission of the vocal sound signal through the antenna ANT2 is interrupted. As an alternative to this, electric power is supplied to a wired output system (the earphone power amplifier 82) so that an audio signal composed of an accompanying sound signal and a vocal sound signal is transmitted to the external audio apparatus. As a result, the operation which has been performed by a conventional and usual wired accompaniment apparatus is performed. When the earphone is inserted into the jack switch JACK1 in place of the external audio apparatus, the audio signal composed of an accompanying sound signal and a vocal sound signal can be transmitted through the earphone due to the

stereo operation of the earphone power amplifier 82. As a result, a user is able to solely and silently practice singing or enjoy listening of stereo music.

As described above, according to the present embodiment, the apparatus capable of simultaneously transmitting a background image, lyrics and accompanying sound in a wireless manner is included in the body of the microphone having a small size. Thus, the necessity of providing an individual apparatus can be eliminated to allow a user to sing a song to follow the guide caption while watching the background image by using only one microphone if a usual television receiver or an FM radio receiver is provided. Therefore, portability of the accompaniment apparatus can be improved and the "karaoke" machine can be enjoyed without limitation when used. Thus, anyone is allowed to play singing in any place, such as home, in an automobile or outdoor. Moreover, the apparatus according to the present embodiment is able to transmit an audio signal through the earphone as well as transmitting the same in the wireless manner, a user is able to practice singing or enjoy only the accompanying sound while watching the caption.

The present invention is not limited to the foregoing embodiment and a various modifications may be permitted. For example, although the description has been made that the memory for storing the accompanying sound and lyrics for tunes is fixedly provided for the apparatus, a card-like memory may be employed so as to form a changeable structure. If change is not permitted, a nonvolatile memory may be employed to enable information to be rewritten. A mini disk or the like may be employed in place of the semiconductor memory.

Although the video output and audio output are constituted by individual transmission systems, the FM transmission system for transmitting sound may be omitted because the sound signal is included in the television signal to be transmitted. In the foregoing case, it is preferable that the television signal is provided with stereo sound signal. A structure provided with only an audio output system without the video output system may be employed. In the foregoing case, the sound signal is not limited to the stereo sound signal but the monaural sound signal may be employed.

As described above, according to the present invention, the wireless accompaniment apparatus exhibiting excellent portability, small size, light weight and low cost can be provided.

Although only a few exemplary embodiments of the present invention have been described in detail above, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of the present invention. Accordingly, all such modifications are intended to be included within the scope of the present invention as defined in the following claims. In the claims, means-plus-function clause are intended to cover the structures described herein as performing the recited func-

tion and not only structural equivalents but also equivalent structures.

## Claims

1. A wireless accompaniment apparatus comprising an apparatus body for transmitting an accompanying sound and lyrics to at least one of a television receiver and a radio receiver in a wireless manner, the apparatus body being provided in a body of a microphone, characterized in that said apparatus body comprises:

a program memory (21) for storing a program and data;

a microprocessor (22) for controlling an overall apparatus in accordance with the program and the data read from said program memory;

an image memory (30) for storing image data and lyrics data;

a liquid crystal display (41) for displaying selection and reservation states of a tune;

a sound memory (45) for storing accompanying sound data;

a sound source circuit (50) for processing the accompanying sound data corresponding to a desired tune and read from said sound memory so as to reproduce an accompanying sound signal;

a video processor (70) for converting image data and lyrics data corresponding to the desired tune and read from said image memory into a television signal; and

transmitter means including at least one of first transmission means (90) for mixing the television signal output from said video processor and a vocal sound signal supplied from a microphone so as to transmit a mixed signal to the television receiver in a wireless manner and second transmission means (80, 84) for mixing the accompanying sound signal output from said sound source circuit and the vocal sound signal supplied from the microphone so as to transmit a mixed signal to the radio receiver in a wireless manner.

2. A wireless accompaniment apparatus according to claim 1, characterized in that said sound source circuit (50) comprises a MIDI (Music Instrument Digital Interface) interface (52), which is under control of said microprocessor to control said sound source circuit, a PCM (Pulse Code Modulated) data memory (53) for storing PCM data, and a digital signal processor (51) which produces a digital sound signal by using the accompanying data read from said sound memory and said PCM data read from said PCM data memory.
3. A wireless accompaniment apparatus according to

claim 1, characterized in that said video processor (70) comprises a video data processor chip, a video memory for expanding compressed image data and temporarily storing an expanded image data, and a video signal synchronization separation circuit and reads the image data and the lyrics data under control of said microprocessor so as to transmit a television signal to a video capture board.

4. A wireless accompaniment apparatus according to claim 1, characterized in that said second transmission means comprises means (84) for stereo-modulating a signal produced by mixing the vocal sound signal and the accompanying sound signal.

5. A wireless accompaniment apparatus according to claim 1, characterized in that said program memory (21) and said microprocessor (22) are formed in one package (20).

6. A wireless accompaniment apparatus according to claim 1, characterized in that said image memory (30) comprises a program logic circuit (32) and a data memory (31) for said program logic circuit, and said program logic circuit and said data memory are formed in one package.

7. A wireless accompaniment apparatus according to claim 2, characterized in that said MIDI interface (52), said PCM data memory (53), and said digital signal processor (51) are formed in one package (50).

8. A wireless accompaniment apparatus according to claim 1, characterized in that said program memory (21), said microprocessor (22), said image memory (30), and said sound source circuit (50) are formed in one package.

9. A wireless accompaniment apparatus characterized by comprising:

a microphone (11) for inputting a vocal sound; means (30), provided in said microphone, for storing accompanying data; and first transmission means (80), provided in said microphone, for synthesizing the accompanying data and an input vocal sound signal so as to transmit a synthesized signal in a wireless manner, said wireless accompaniment apparatus being, in a wireless manner, connected to a first terminal apparatus having signal receiving means and loudspeaker means.

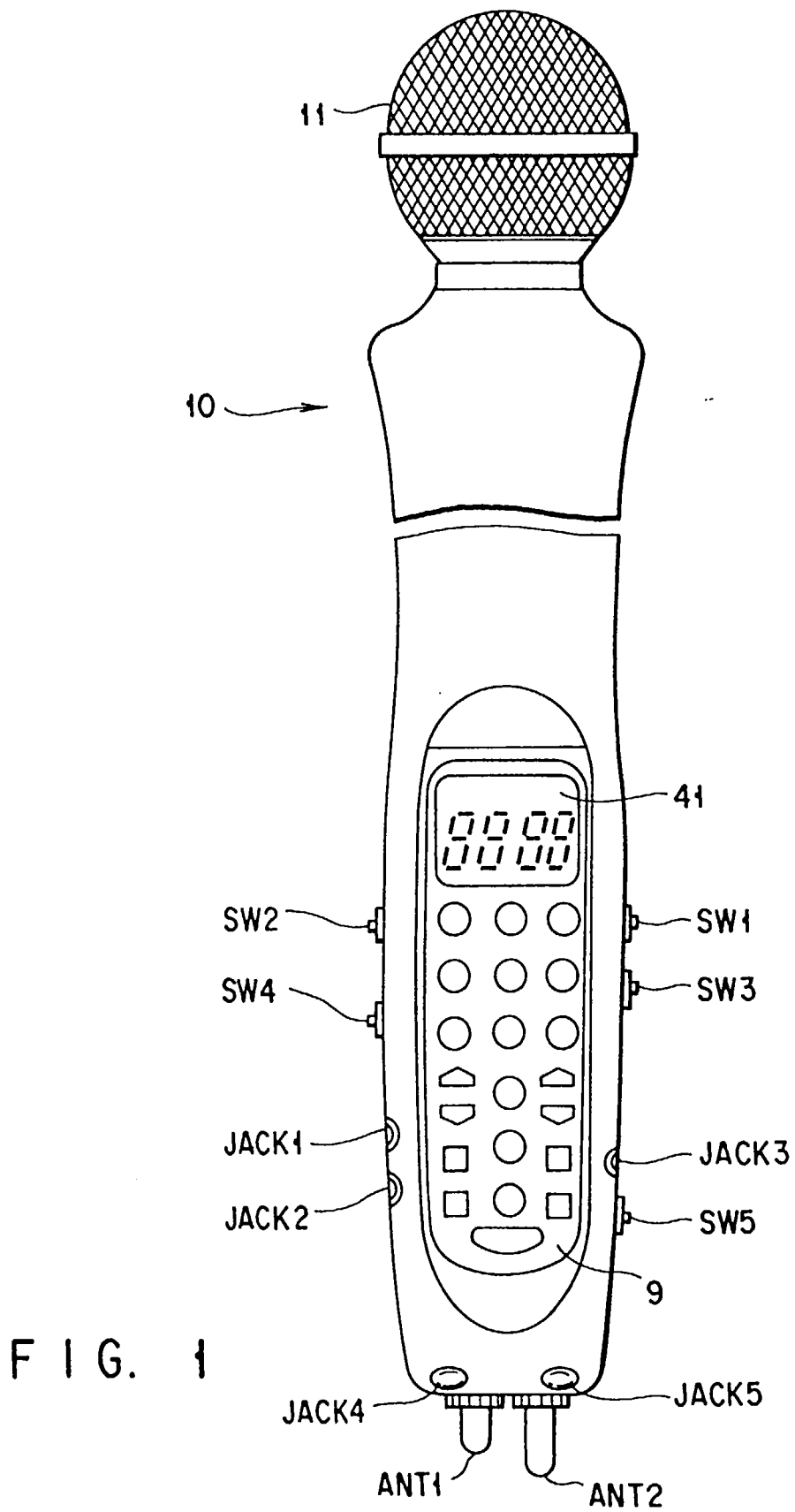
10. A wireless accompaniment apparatus according to claim 9, characterized by further comprising:

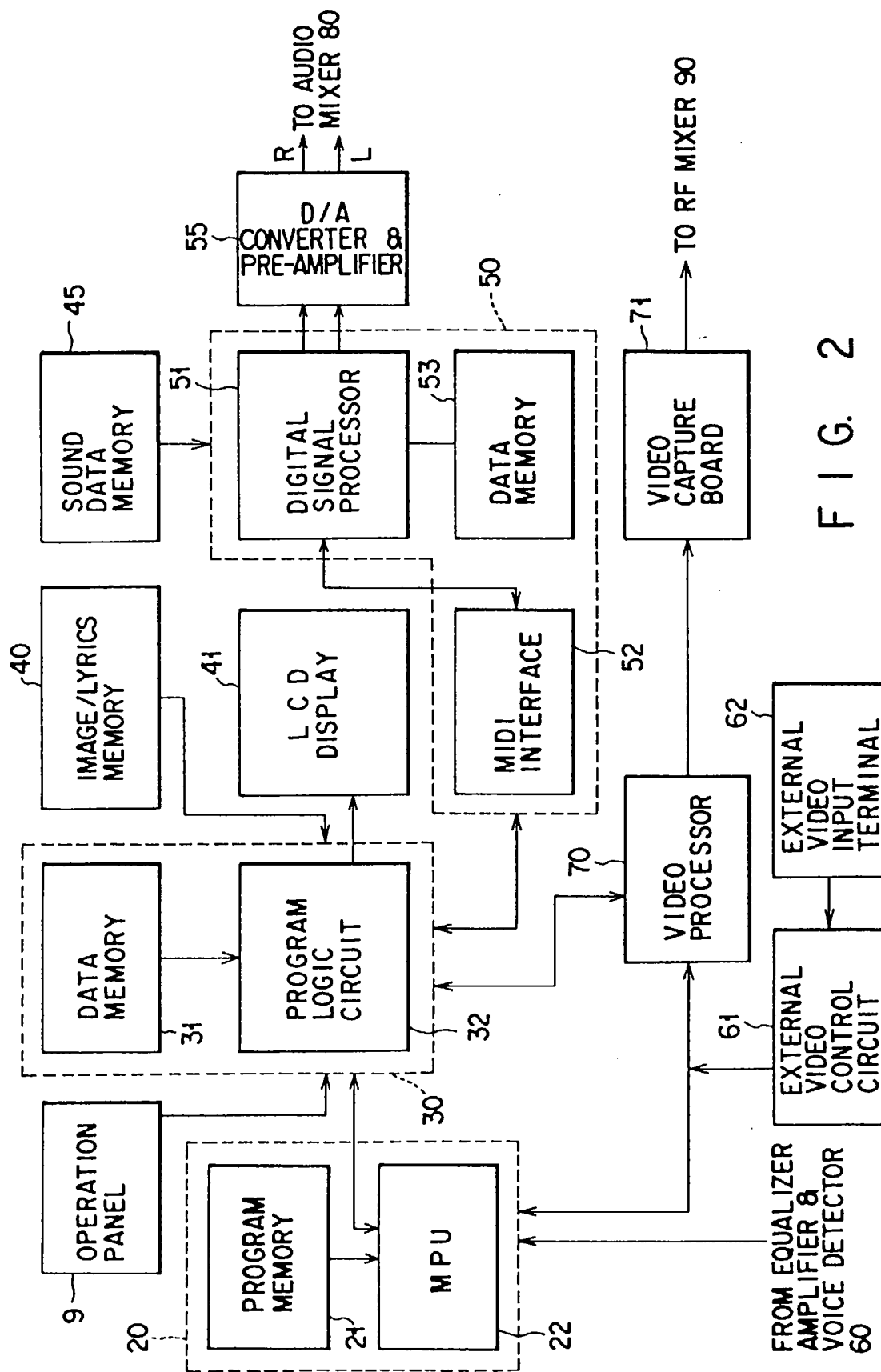
means (40), provided in said microphone, for storing lyrics data; and

second transmission means (90) for transmitting a caption signal indicating lyrics in a wireless manner, and in which said wireless accompaniment apparatus is, in a wireless manner, connected to a second terminal apparatus having signal receiving means, speaker means, and display means.

11. A wireless accompaniment apparatus according to claim 10, characterized by further comprising:

means (40), provided in said microphone, for storing background image data; and means (50) for superimposing a background image and a caption so as to transmit a superimposed signal in a wireless manner.







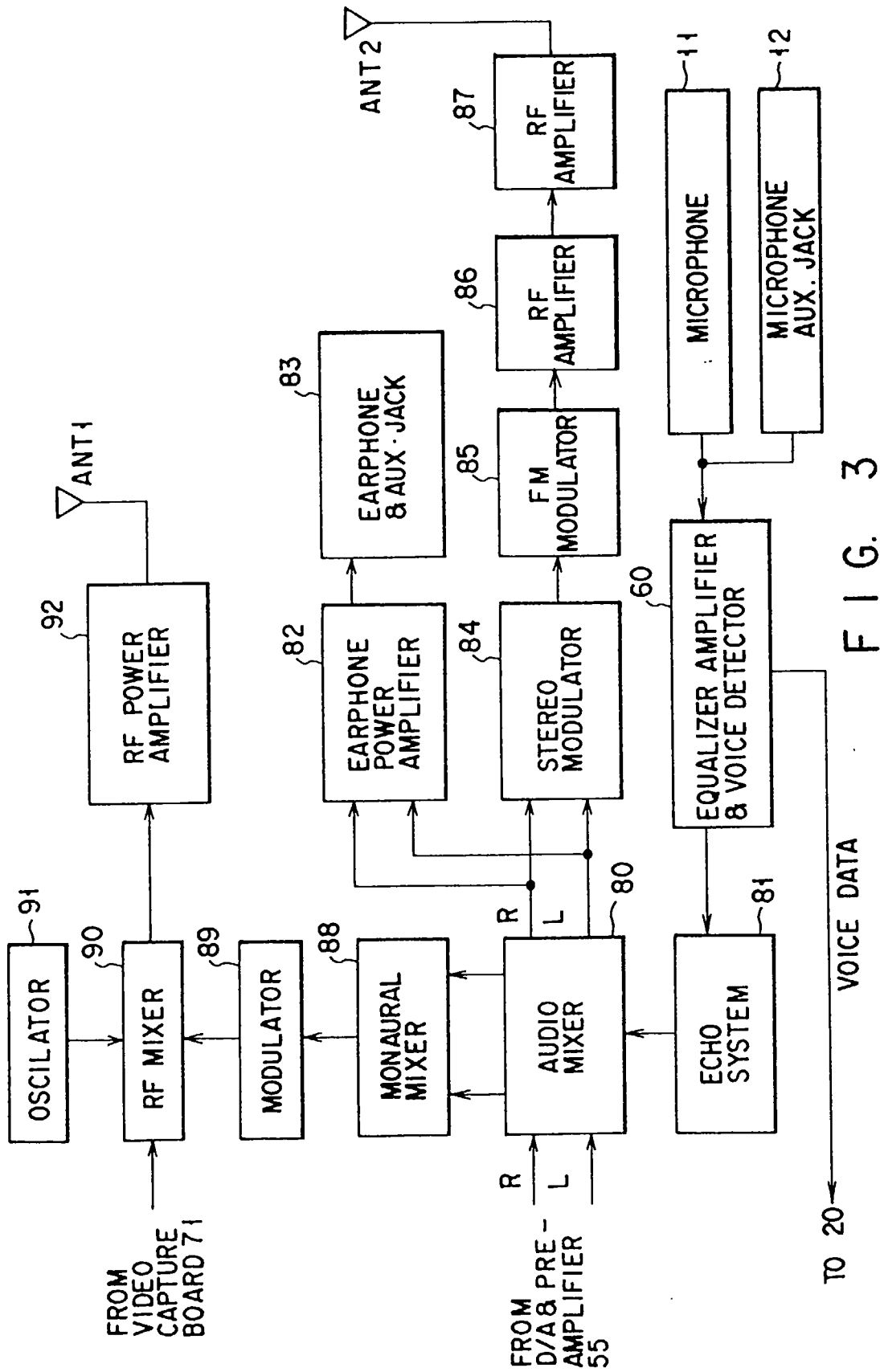


FIG. 3



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# EUROPEAN SEARCH REPORT

Application Number  
EP 96 83 0271

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP-A-0 675 666 (ARTIF TECHNOLOGY CORP) 4 October 1995 * column 2, line 34 - column 4, line 44; figures 1A-2 *	1-3,5-8	G10H1/00
A	---	9-11	
A	GB-A-2 236 643 (RUMFITT DUDLEY LLOYD) 10 April 1991 * page 1, line 1 - page 2, line 22; figure 1 *	1,9	
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The present search report has been drawn up for all claims			<b>TECHNICAL FIELDS SEARCHED (Int.Cl.6)</b>  G10H
Place of search		Date of completion of the search	Examiner
THE HAGUE		9 October 1996	Pulluard, R
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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