

TELEPHONE ANSWERING DEVICE

The present invention relates to an automatic telephone answering device.

In the conventional telephone answering device,
5 when a user plays back a plurality of messages received from customers in his absence, remotely from a remote location or manually at home, it is the current practice to play back the tape wholly from the beginning position and thereafter to set the device to
10 the standby mode. There is no proper means in case the user is going to play back the last one or two messages properly.

According to the prior art, in case the user wants to play back the last or second-to-last message
15 properly from the starting position thereof, there is no means but to rewind the tape at first and stop it at a reasonable position for reproduction by guessing. If not stopped, the tape is rewound to its beginning position so that the messages may be reproduced
20 sequentially from the beginning. In this case, therefore, if dozens of messages are recorded, a long time, some wasted, to play back is required. This is a problem inherent in the conventional telephone answering device.

The present invention seeks to provide a more convenient machine as is set out in claim 1 or claim 2 of the claims of this specification.

5 An example of the invention will now be described with reference to the accompanying drawings in which:

Fig. 1 is a block diagram showing the embodiment of the present invention;

Figs. 2, 3 and 5 are flow charts showing operation of the invention; and

10 Fig. 4 is an explanatory diagram of the invention.

An embodiment of the present invention will be described in the following in connection with its specific structure and operations.

15 In Fig. 1: reference letters L1 and L2 designate telephone lines; letters LT designate a line transformer; and numeral 1 designates a one-chip microprocessor (CPU) which is composed of a ROM (i.e., Read Only Memory) having a stored program and a RAM (i.e., Random Access Memory) for storing the tape
20 positions when each of a number of incoming messages

(ICM) is to be started and stopped as described later. Moreover, characters I-1 and I-2 designate input ports; characters O-1, O-2 and O-3 designate output ports; characters I/O-1 designate a bidirectional input/output port; and letters INT designate an interruption terminal. Letters COUNT designate a count input terminal which is connected with a counter built in the CPU, for counting pulses for storing a later-described tape position.

On the other hand, characters Y-1 is a telephone line engaging relay and Y-2 is a recording and playback switching relay, which are connected with the aforementioned output ports. Letters BAT designate a backup battery for backing up the RAM when the service is interrupted. Numeral 2 designates a keyboard which is equipped with a plurality of keys such as a key for setting the present device in an automatic answering and recording mode (hereinafter referred to as an "AUTO key"), a key for rewinding an incoming message (ICM) tape (hereinafter referred to as "REW key"), a key for reproducing the ICM tape (10) (hereinafter referred to as a "PLAY key"), or keys for other operations.

Numeral 3 designates a NOR gate through which the aforementioned CPU is interrupted when one key of the keyboard is depressed. Numeral 4 designates a line monitor circuit for detecting a ringing signal coming in the aforementioned telephone lines and the voltage change of the telephone lines when a calling party hooks on a handset (although not shown). Numeral 5 designates an OGM sending section sending out an outgoing message (OGM) recorded in a solid memory. Numerals 6 to 8 designate amplifiers; numeral 9 designates a loudspeaker; numeral 10 designates an ICM tape for recording the ICMs from the calling party;

numeral 11 designates a record playback head; and letter M designates a motor for driving the ICM tape. The means for rewinding the tape and forwarding the tape at normal speed for reproduction and recording is well known in the art and is not shown.

Numeral 12 designates a light emitting diode (LED), and numeral 13 designates a disc which is rotatable in accordance with movement of the ICM tape 10. This disc 13 is formed with slots, as shown, so that the optical beam coming from the LED 12 reaches a photo-transistor 14 through the slots. As a result, the optical beam is introduced, as intermittent pulses while the ICM tape is running, into the count input terminal COUNT of the CPU so that the known tape position is determined according to the number of the pulses. Thus, a so-called "electronic tape counter" is provided.

Next, the operations in the automatic answering and recording mode will be described with reference to the flow chart of Fig. 2 when the AUTO key (although not shown) of the keyboard 2 is depressed. At Step S1, the ringing signals coming in from the telephone lines L1 and L2 are checked at all times through the line monitor circuit 4. If a ringing signal comes in, the output of the line monitor circuit 4 is detected by the program through the input port I-1. If YES, the routine advances to subsequent Step S2. At this Step, the relay Y-1 is retained ON through the output port O-1 to engage the telephone lines through its contact y1-1. Then, the ringing signal is stopped to establish the off-hook mode. The OGM sending section 5 is started in response to a command from the input/output port I/O-1 so that the OGM recorded in advance is sent out (at Step S3) to the telephone lines through the

line transformer LT. If the end of the sending of the OGM is detected at Step S4, the DC motor M is energized at Step S5 through the output port O-3 and a transistor Q-1 so that movement of the ICM tape 10 is started in the recording mode by well-known means. Simultaneously, at Step S6, the start position of the ICM tape 10 is stored in the RAM of the CPU. Since movement is ordinarily started from the beginning position of the tape, the first start position is stored in the RAM-0 at a value "0", as shown in Fig. 4. During this run of the ICM tape 10, moreover, the disc 13 rotates so that the optical pulses transmitting through the slots of the disc are continuously counted by the counter in the CPU 1, as described hereinbefore. At Step S7, the recording end is determined if the onhook by which the calling party hooks on the handset is detected through the line monitor circuit 4, and movement of the ICM tape 10 is stopped (at Step S8). The tape position at this time is stored as the aforementioned pulse number in the RAM (e.g., at 255) in the RAM-1 in the case of the first incoming message ICM-1. At Step S10, the engaging of the telephone lines is then released to restore the standby mode of the Step S1.

The operations described above are repeated, and the memory RAM is stored within the individual start positions and stop positions of the incoming messages ICM-1 to ICM-4, for example, as shown in Fig. 4. Here, the memory can be commonly shared because the value of the stop position of the precedent message and the value of the start position of the subsequent message are equal.

Next, the operations of reproducing the incoming messages recorded, as described above, and rewinding a portion of them will be described with reference to the

flow charts of Figs. 3 and 4. For these operations, the PLAY key or REW key of the keyboard of Fig. 1 is depressed. The automatic telephone answering device of recent years has its operations simplified such that

5 the ICM tape is rewound to the starting point (or the incoming messages unheard) without depressing the rewinding key, if a key corresponding to the PLAY key is depressed, thereby to switch the operations automatically to the reproduction and such that the ICM

10 tape is automatically stopped if all the recorded incoming messages are reproduced. The flow chart of Fig. 3 uses the same means. If the aforementioned PLAY key is depressed, the program calls the subroutine shown in the flow chart of Fig. 3.

15 At Step S20, the REW key counter for storing the number of depressions of the REW key in the keyboard 2 of Fig. 1 is cleared. This REW key counter will be described in detail with reference to Fig. 5. At Step S21, rewinding of the ICM tape 10 recorded with the

20 incoming messages is started by known means. It is assumed that the maximum of the aforementioned tape counter is at "1080", as shown in Fig. 4. When the counted value is reduced (at Step S22) by rewinding to "0" at the start of the ICM tape 10, rewinding is

25 switched to reproduction (at Step 23) by known means. During reproduction, the value of the tape counter is gradually increased from the value "0" in accordance with movement of the ICM tape 10 until it reaches (at Step S24) the maximum stored in the memory RAM, i.e.,

30 the value "1080" shown in Fig. 4. Then, movement of this ICM tape is stopped (at Step S25) to release the reproduction mode.

In the aforementioned reproduction of the ICM tape 10, the aforementioned REW key is depressed one time so

as to playback the incoming message being played back once more from the beginning. The interruption is generated by the depression to call the subroutine shown in Fig. 5.

5 At Step S30, movement of the ICM tape is stopped.
 At Step S31, it is checked whether or not the
 interruption terminal INT of the CPU 1 of Fig. 1 is at
 the L level. While the aforementioned REW key is being
 depressed, the INT terminal is at the L level so that
 10 the Step S31 is YES to proceed the subroutine to
 subsequent Step S33. At this Step S33, the value of
 the aforementioned REW key counter is incremented by
 +1. Since this counter was cleared at the foregoing
 Step S20, it takes the value "1". At Step S34, it is
 15 tested whether or not the INT terminal is at the H
 level. If the depression of the REW key is released,
 the INT terminal is returned to the H level so that the
 Step S34 is YES to return the subroutine to the Step
 S31. If a time of 0.5 sec elapses at Step S32 without
 20 depressing the REW key again, the subroutine advances
 to Step S35. If, at this Step S35, the value of the
 tape counter when the REW key is depressed to stop the
 ICM tape is at "500", for example, it is revealed by
 retrieving the content of the memory RAM that the
 25 incoming message having been played back is the second
 ICM-2. At Step S36, rewinding of the ICM tape is
 started to the counted value (i.e., the start position
 of the incoming message decremented by 1 from the
 number of depressions of the REW key) of the REW key.
 30 If the tape position at present is at "500" of the
 value of the tape counter and if the number of
 depression of the REW key is 1, the ICM tape 10 is
 rewound, according to the content of the RAM of Fig. 4,
 to the start position "256", i.e., from the value "500"

to the value "256" of the tape counter. If this rewind is ended at Step S37, the REW key counter is cleared at Step S38 so as to cope with the subsequent depression of the REW key. Then, the routine is returned through this subroutine to the reproduction subroutine of Fig. 3 so that the incoming message is reproduced again from the rewound position.

In case the REW key is depressed, not once but twice, in the embodiment described above, the counted value of the REW key is at "2" at the Step S35. Then, the ICM tape is rewound from the start position of the incoming message further decremented by -1, i.e., the start position "0" of the ICM-1 of Fig. 4, and reproduction is accomplished again from that position. In case the REW key is depressed more often than necessary, excessive depression can be coped with by the automatic reproduction which, although not shown in the flow chart, is caused by rewinding the tape to the beginning position of the ICM tape based on the number of the incoming messages recorded.

Incidentally, it is necessary from the relation to the aforementioned Step S32 that depressions of the REW key of two or more times be accomplished without an interruption of 0.5 sec. or longer.

As has been described hereinbefore, the present invention is different from the prior art in which the tape is blindly rewound and stopped for reproducing the second-to-last or third-to-last message properly and promptly in case the automatic telephone answering device of the prior art is recorded with dozens of messages and held in the standby state. According to the present invention, on the contrary, proper reproduction and retrieval can be accomplished by depressing the button two times, when the second-to-

last message is to be heard, and by depressing the same three times when the third-to-last message is to be heard. Thus, the present invention prevents any waste of such time so that it has a high practical effect in the automatic telephone answering device.

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Although a certain preferred embodiment has been shown and described, it should be understood that many changes and modifications may be made therein without departing from the scope of the invention.

**CLAIMS**

1. A telephone answering machine comprising means to record a plurality of incoming messages on a tape, means to rewind the tape, means to play back the messages from the tape, means to reset the machine to a receiving mode after playback, and a button responsive to a given number of operations to cause the rewind means after said given number of operations to wind the tape back over a length of only the last said given number of recorded messages.

2. A telephone answering machine comprising means to record a plurality of incoming messages on a tape, means to rewind the tape, means to play back the messages from the tape, means to reset the machine to a receiving mode after playback, means for storing the start positions of incoming messages recorded on said tape, and a button responsive to a given number of operations to cause the rewind means after said given number of operations to wind the tape back over a length of only the last said given number of recorded messages by counting the said given number of start positions through which the tape is rewound.

3. A telephone answering machine substantially as hereinbefore described with reference to the accompanying drawings.
