

TELEPHONE ANSWERING DEVICE

The present invention relates to a telephone answering device connectable to a telephone line in tandem with a telephone.

Previously, telephone answering devices (hereinafter called TAD) connected to existing telephones in parallel or combined with telephones, have been widely used. However, there is typically the problem that if a called party keeps the telephone off the hook, expecting a calling party to be one of its family members, while a call signal is being received or while the TAD is in operation, the TAD will immediately return to a stand-by mode and proper answering cannot be assured.

Generally the TAD does not operate or stops operating and returns to a stand-by mode, when an infant, for instance, keeps the telephone off the hook, while a call signal is being received or while TAD is in operation. Even though an adult family member hastens to take up the handset, the telephone call may have been cut off. The problem, which is important in this case, is that the telephone call from the calling party is disconnected because of the TAD thus installed.

It is an object of this invention to provide an improved telephone answering device which overcomes or ameliorates these difficulties.

Accordingly, the present invention consists in a telephone answering device for connection with a telephone line in tandem with a telephone, the device comprising means for detecting the on/off-hook condition of the telephone after receipt of a call signal along the telephone line but before engagement of the telephone line by said device and for providing signals indicative of the telephone being set off-hook and on-hook respectively; a timer connected so as to provide a pre-settable time interval after receipt of a signal from the detection means indicating that the telephone has been set off-hook; and control means connected with the detection means and with the timer and

adapted, where a signal is received from the detection means indicating that the telephone has been set off-hook, to initiate or continue conventional operation of the telephone answering device in the case where a signal is received from the detection means within said time interval indicating that the telephone has been set on-hook and, in the case where no such signal is received within the said time interval, to disable conventional operation of the telephone answering device.

The present invention further consists in a telephone answering device connectable to a telephone line, comprising:

- outgoing message generator means for supplying an outgoing message to said telephone line;

- a ring detector connectable to said telephone line for detecting a ring signal;

- ring counter means responsive to said ring detector for counting a predetermined number of said ring signals;

- a telephone instrument status detector for detecting an on-hook/off-hook status of a telephone instrument connected to said telephone line; and

- activation means for activating said outgoing message generator means in response to detecting an off-hook status prior to said ring counter counting said predetermined number of ring signals followed by detection of an on-hook status within a predetermined time period thereafter.

The invention will now be described by way of example with reference to the accompanying drawings, in which:—

Fig. 1 is a block diagram showing the first embodiment of the present invention applied to a telephone answering device and a telephone which are provided independently of each other.

Fig. 2 is a block diagram showing the second embodiment of the present invention applied to a combination of a telephone answering device and a telephone.

Figs. 3 and 4 are flowcharts illustrating the operation of the first embodiment.

In Fig. 1, illustrating the first embodiment, L1 and L2 refer to telephone lines, TEL to a telephone and TAD to a telephone answering device, the TEL and the TAD being independent of each other. In the TAD, a line monitor circuit 1, though illustrated in a simplified form, is connected to the telephone lines via resistors R1 and R2 having high resistance values, the line monitor circuit being used for detecting the variation of the (telephone) line voltage caused by a call signal from a central telephone exchange and the on-/off-hook condition of the TEL connected to said TAD in parallel. An a.c. signal is taken as the call signal from an output terminal OUT1. The output detected from the on-/off-hook condition of the telephone as a single body is taken from an output terminal OUT2. The output detected from the on-/off-hook condition of the telephone with the TAD in operation is taken from an output terminal OUT3. The TAD further includes a single chip microprocessor CPU containing programs in the form of a ROM, input ports I-1 – I-5; and output ports O-1 – O-6; and a slide switch SW1 as a changeover switch for validating or invalidating a timer (which will be described later) to be operated when the telephone is set on-/off-the-hook; a memory 2 for recording an outgoing message (OGM) in the form of a digital signal; a voice analyzing-synthesizing circuit LSI 3 for converting the OGM stored in the

memory into an analogue audio signal; an analogue switch 4; an amplifier circuit 5; a recorder 6 for recording an incoming message (ICM) from a calling party, the ICM recorder employing a cassette tape; a motor M for driving the cassette tape, a solenoid SD for switching the operation of the cassette tape, and a relay for looping telephone lines via a line transformer LT when the call signal is detected, the relay having a contact Y1-1.

The operation of the first embodiment shown will be described in detail with reference to the flowcharts of Figs. 3 and 4. When the call signal is received from the central telephone exchange via the telephone lines L1 and L2, it is applied via the resistors R1 and R2 to the line monitor circuit 1. The call signal is also applied from the OUT 1 via an operational amplifier OP1 to the input port I-1 of the CPU. In this case, the CPU proceeds to STEP S2 when it decides the signal applied to the input Port I-1 in STEP S1 to be the a.c. signal as the call signal. An item-to-item description will further be given of respective states wherein the off-hook condition of the telephone is present or absent and wherein the timer SW1 is turned on.

a. Description of the operation in the case where the TEL is not set off the hook.

In STEP S2, a test is made to see whether the switch SW1 is held on or off. If the SW1 is held on, the 3-second timer will be cancelled as described later. When SW1 is held off, STEP S3 is followed. If the telephone is not set off the hook in this case, STEP S4 is followed. When the call signal is repeatedly input three times, the condition of STEP S4 is satisfied and STEP S5 is followed. By holding the relay Y-1 of Fig. 1 on, the telephone lines L1 and L2 are looped via the contact Y1-1 and a line transformer LT, so that the call signal is suspended. In STEP S6, the outgoing message (OGM) pre-recorded via the voice analyzing-synthesizing LSI 3 according to the instructions given through the output port O-4 of the CPU, is read from the memory 2 and the transmission thereof to the calling party is started via the analogue switch 4, the amplifier circuit 5 and the line transformer LT. The termination of the transmission of the

6

outgoing message (OGM) in STEP S8 can be detected by detecting the output of the voice analyzing-synthesizing LSI 3 via the input port I-5 of the CPU. In the meantime, the testing of the off-hook condition of the telephone in STEP S7 is looped. When the outgoing message is completely transmitted with the TEL being not off the hook, STEP S18 is followed and the mode is switched over to one in which the message (ICM) from the calling party is recorded. In other words, the motor M and the solenoid are driven to feed the cassette tape (not shown) in the ICM recorder at constant speed. The ICM recorder is thus switched over to the recording mode according to the instructions given through the output port O-6 and the recording of the message from the calling party on the cassette tape is started. The recording operation is terminated when the termination of the recording of the message from the calling party is detected by a voice control circuit (not shown) (STEP S19).

Then the motor M, the solenoid SD, the relay Y-1 and the like are released (STEP S20) and the TAD returns to the stand-by mode in STEP S1.

b. Description of the operation in the case where the TEL is set off the hook while the call signal is received.

As STEP S3 and STEP S4 are looped until the telephone lines are looped by the contact Y1-1 of the relay Y-1 with the call signal sent in three times after the call signal is received, the off-hook condition of the telephone can be detected via the line monitor circuit 1. Since the call signal stops when the TEL is set off the hook, the TEL is recognized as being off-hook. This satisfies the condition of STEP S3, and then STEP S12 is followed. The CPU contains the timer to be controlled by a program and starts the 3-second timer in STEP S12 in this embodiment. The on-hook condition of the TEL is tested via the line monitor circuit 1 and the input port I-3 in STEP S13 until a predetermined period of the 3-second timer elapses in STEP S14.

However, if the TEL remains off the hook after the lapse of three seconds, the condition of STEP S14 is satisfied and STEP S1 is followed again, so that the TAD returns to the stand-by mode wherein it awaits the next call signal.

Since the TEL still remains off the hook, on the other hand, the telephone conversation with the calling party can be held.

If the TEL is set on the hook within three seconds of the predetermined period set in STEP S14, the condition of STEP S13 is satisfied and STEP S15 is followed. Also, the TAD starts as described below. In other words, the relay Y-1 as a load is turned on via the output port 0-1 under instructions from the CPU in STEP S15, and the telephone lines L1 and L2 are looped via the contact Y1-1. The transmission of the outgoing message is started in STEP S16 and when the transmission thereof is completed (STEP S17), the mode is switched over to the recording mode in which the message (ICM) from the calling party is recorded (STEP S18). When ICM is completely recorded (STEP S19), the TAD returns to the stand-by mode (STEP 20) and STEP S1 for awaiting the next incoming call is followed again.

Even if an infant keeps the TEL off the hook by mistake during the particular period when a call signal is received but the TAD is not operated yet, the TAD can be started by setting the TEL on the hook within three seconds or such other appropriate period as may be set in the timer. Moreover, if the TEL is set off the hook to monitor the voice of a calling party when a call signal is received, and if a called party prefers not to talk to the calling party directly, the called party may set the telephone on the hook and leave answering to the TAD.

If the TEL is set off the hook before a call signal is received, it is possible to dial a call independently of the TAD.

c. Description of operation when the changeover switch SW1 is switched to the ON side.

When a call signal is received, the conditions of STEP S1 and STEP S2 are satisfied in order, and STEP S21 is followed via a terminal (B) of Fig. 4. In Fig. 4, the 3-second timer stated above becomes irrelevant and the TAD performs a standard operation. When the TEL is set off the hook in STEPs S21, S25 and S28, the TAD returns immediately to the stand-by mode and communication by TEL becomes possible.

The switch SW1 is positioned so that it can be operated by the user but is protected from accidental operation or operation by a child.

A description will now be given of a second embodiment of this invention, with reference to Fig. 2. In this second embodiment, a telephone answering device is incorporated with a telephone in the same housing. In Fig. 2, L1 and L2 refer to telephone lines, 20 to a call signal detection circuit, 21 to a diode bridge circuit, 22 to an IC for the telephone, 23 to a handset, 24 to a memory for OGM, 25 to a voice analyzing-synthesizing LSI circuit, 26 to an amplifier circuit, 27 to an ICM recorder, SW1 to a changeover switch whose function is similar to that of SW1 of Fig. 1, and HS1 and HS2 to hook switches interlocked with the handset 23.

When a call signal is received via the telephone lines L1 and L2 of Fig. 2, the call signal is detected by a program (not shown in the flow chart) via the call signal detection circuit 20 and the input port I-1 of the CPU, and the output from the output port O-1 causes transistors Q1 and Q2 to be held on via a diode D3.

In this case, the diode bridge 21, the transistor Q1 and a constant current circuit in the IC 22 for telephone constitute the closed circuit of the telephone lines, which stops the reception of the call signal. Subsequently, under instructions from the CPU, the outgoing message (OGM) recorded in a memory 24 is sent to the telephone lines L1 and L2 via the voice analyzing-synthesizing LSI 25, the amplifier circuit 26, the transistor Q1 and the diode bridge 21. When the outgoing message is completely transmitted, the solenoid SD and the motor M are energized as shown in Fig. 1 and a message (ICM) from a calling party is recorded in an ICM recorder 27. When the message recording is terminated, the stand-by mode is restored.

While the changeover switch SW1 (whose function is similar to what is shown in Fig. 1) remains at the OFF position, the hook switches HS1 and HS2 interlocked with the handset 23 are closed if the handset 23 is set off the hook before the TAD starts to loop the telephone lines of receiving the call signal. In this case, the voltage of the telephone line turns on the

transistors Q1 and Q2 via the diode bridge 21, HS1, a diode D2 and a resistor R10, so that the telephone lines L1 and L2 are looped. The 3-second timer starts at this time as described in the first embodiment. Simultaneously, an H-level signal is output from the output port 0-2 for three seconds to turn on a transistor Q3 and to earth the microphone T of the handset 23, whereby the voice of any one who has set the handset off the hook is prevented from being heard by the calling party. However, the voice of the calling party can be monitored because the speaker R of the handset remains in operation. Even when the handset is deliberately set off the hook, to monitor the voice of the calling party, this is undetectable by the calling party. If the called party elects not to talk to the calling party, directly after monitoring, the former may set the handset 23 on the hook within three seconds so as to start the TAD by the signal through the output port 0-1 as in the case of the first embodiment. The outgoing message is then sent to the calling party.

When the called party sets the handset 23 on the hook again within three seconds after setting it off the hook while the outgoing message is being sent out or while the message from the calling party is being recorded, the TAD keeps functioning as it ought to function. When the called party otherwise sets the handset off the hook continuously for over three seconds, the TAD stops functioning and returns to the stand-by mode. However, a telephone conversation with the calling party can be held as the telephone lines are still looped via the hook switch HS1.

Since the second embodiment is substantially similar in function to the first embodiment, the description of its operation with reference to a flowchart is omitted. The operation with the changeover switch SW1 being turned off is also similar to that of the first embodiment. As the TAD is incorporated with the telephone in the second embodiment, the microphone of the handset can simply be made inoperative during the operation of the timer for three seconds.

It will be understood that the present invention has been described above purely by way of example, and modifications of detail can be made within the scope of the invention.

CLAIMS

1. A telephone answering device for connection with a telephone line in tandem with a telephone, the device comprising means for detecting the on/off-hook condition of the telephone after receipt of a call signal along the telephone line but before engagement of the telephone line by said device and for providing signals indicative of the telephone being set off-hook and on-hook respectively; a timer connected so as to provide a pre-settable time interval after receipt of a signal from the detection means indicating that the telephone has been set off-hook; and control means connected with the detection means and with the timer and adapted, where a signal is received from the detection means indicating that the telephone has been set off-hook, to initiate or continue conventional operation of the telephone answering device in the case where a signal is received from the detection means within said time interval indicating that the telephone has been set on-hook and, in the case where no such signal is received within the said time interval, to disable conventional operation of the telephone answering device.

2. A telephone answering device according to Claim 1, including a further detection means for detecting the on/off-hook condition of the telephone after engagement of the telephone line by said device, and a further timer adapted to be activated on receipt of a signal from the further detection means indicating that the telephone has been set off-hook after engagement of the telephone line by the device.

3. A telephone answering device according to Claim 1, including outgoing message generator means for supplying an outgoing message to said telephone line, and further detection means for detecting the on/off-hook condition of the telephone during supply of said outgoing message to said telephone line, and wherein the control means is adapted, where a signal is received from the further detection means indicating that the telephone has been set off-hook during supply of said outgoing message, to continue



conventional operation of the telephone answering device in the case where a signal is received from the further detection means, within a given time interval after receipt of the off-hook signal, indicating that the telephone has been set on-hook, and, in the case where no such signal is received within said given time interval, to disable conventional operation of the telephone answering device.

4. A telephone answering device according to Claim 1, 2 or 3, further comprising a user selectable switch operative to cancel the operation of said timer such that conventional operation of the telephone answering device is disabled on setting of the telephone off-hook even if the telephone is subsequently, and within a stated time interval, placed on-hook.

5. A telephone answering device connectable to a telephone line, comprising:

outgoing message generator means for supplying an outgoing message to said telephone line;

a ring detector connectable to said telephone line for detecting a ring signal;

ring counter means responsive to said ring detector for counting a predetermined number of said ring signals;

a telephone instrument status detector for detecting an on-hook/off-hook status of a telephone instrument connected to said telephone line; and

activation means for activating said outgoing message generator means in response to detecting an off-hook status prior to said ring counter counting said predetermined number of ring signals followed by detection of an on-hook status within a predetermined time period thereafter.

6. The telephone answering device of claim 5, further comprising:

incoming message recording means for recording an incoming message from said telephone line; and



incoming message initiation means for activating said incoming message recording means after completion of said outgoing message.

7. A telephone answering device substantially as hereinbefore described with reference to and as shown in Fig. 1 or Fig. 2 of the accompanying drawings.

