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REEXAMINATION CERTIFICATE (3356th)

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Richmond et al.

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[54] **DEVICE FOR DETECTING TONES ON TELEPHONE LINES**

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[58] **Field of Search** 379/372, 373, 379/376, 381, 386, 214, 413, 396, 201, 215, 415, 387, 93, 96, 88, 89, 107, 252, 53, 54, 375, 351

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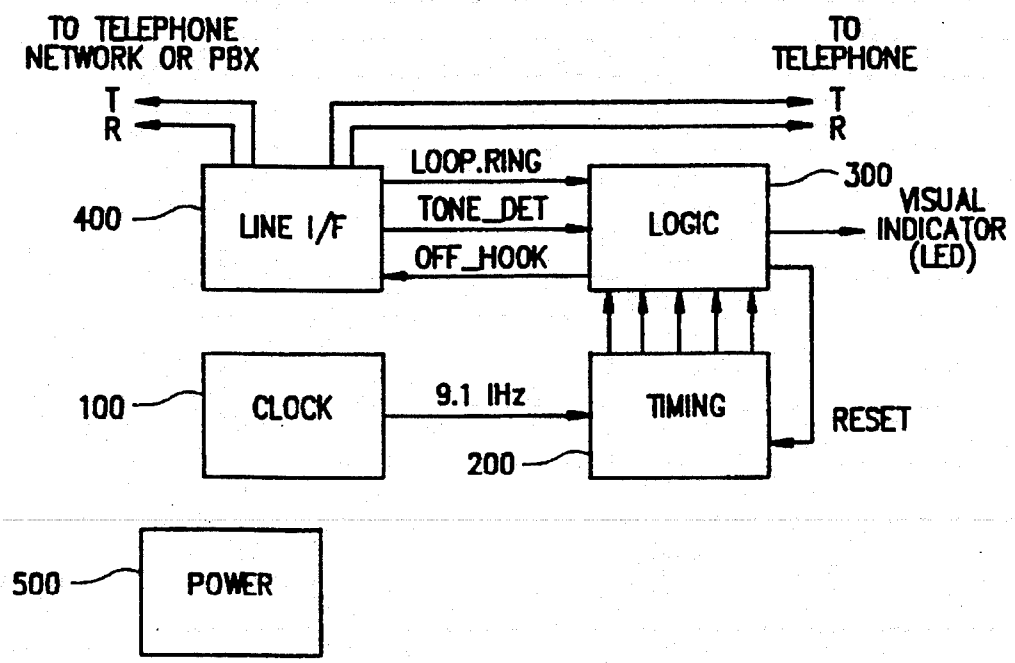
Primary Examiner—Krista M. Zele

[57] **ABSTRACT**

Device for detecting and identifying call progress tones on telephone lines. The application discloses a device for converting auditory call progress tones to visual indications and a novel circuit for identifying and distinguishing call progress tones based on their on-off cadence, if any, along with various alternative embodiments including: (1) a device which converts call progress tones to visual indications as for use by the deaf, (2) a device which is programmed to automatically go off-hook at certain times, detect a tone such as a stuttered dial tone indicating a message waiting, and activate a visual indicator, and (3) the use of a capacitor or rechargeable battery which is periodically refreshed by the device automatically going off-hook and which, while the device is on-hook, provides power required by the device.



REEXAMINATION CERTIFICATE ISSUED UNDER 35 U.S.C. 307

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims **1–8** is confirmed.

New claims **9–29** are added and determined to be patentable.

9. The device of claim 1 further comprising an optical coupler coupled between one of the pair of telephone line conductors and the line interface means.

10. The device of claim 1 further comprising a capacitor coupled between one of the pair of telephone line conductors and the detection means.

11. The device of claim 1 further comprising a ring detection circuit coupled to the pair of telephone line conductors, which ring detection circuit is further coupled to the line interface means and prevents the line interface means from connecting the pair of telephone line conductors with an off hook impedance when a ring is detected.

12. The device of claim 1 wherein the stuttered dial tone has a repeating cadence of a first portion and a second portion and the detection means comprises:

(a) an energy storage component;

(b) a circuit which increases the quantity of energy in the energy storage component during the first portion and decreases the quantity of energy in the energy storage component during the second portion.

13. The device of claim 5 wherein the message waiting signal has a repeating cadence of a first portion and a second portion and the detection means comprises:

(a) an energy storage component;

(b) a circuit which increases the quantity of energy in the energy storage component during the first portion and decreases the quantity of energy in the energy storage component during the second portion.

14. A device for connecting to a pair of telephone line conductors for detecting the presence of a stuttered dial tone on the line, comprising:

(a) a hookswitch circuit which connects the pair of telephone line conductors with an off hook impedance in response to one or more events selected from the following group:

(i) periodically where the periods are between one second and 24 hours,

(ii) within one hour after a use of the line, and

(iii) within one hour after a ring;

(b) a detection circuit which detects the presence of a stuttered dial tone on the line; and

(c) an indicator circuit which is responsive to the detection circuit and indicates whether the stuttered dial tone is present on the line.

15. The device of claim 14 further comprising:

(a) a capacitor coupled to the telephone line conductors;

(b) a charging circuit which charges the capacitor from the telephone line; and

(c) a power circuit which draws power from the capacitor for use by the device.

16. The device of claim 14 further comprising an optical coupler coupled between one of the pair of telephone line conductors and the hookswitch circuit.

17. The device of claim 14 further comprising a capacitor coupled between one of the pair of telephone line conductors and the detection circuit.

18. The device of claim 14 further comprising a ring detection circuit coupled to the pair of telephone line conductors, which ring detection circuit is further coupled to the hookswitch circuit and prevents the hookswitch circuit from connecting the pair of telephone line conductors with an off hook impedance when a ring is detected.

19. The device of claim 14 wherein the stuttered dial tone has a repeating cadence of a first portion and a second portion and the detection circuit comprises:

(a) an energy storage component;

(b) a circuit which increases the quantity of energy in the energy storage component during the first portion and decreases the quantity of energy in the energy storage component during the second portion.

20. The device of claim 1 wherein the detection means further comprises:

(a) means for sensing on the line a voltage over time;

(b) means for converting the voltage over time, if a stuttered dial tone is present, to a high-low cadence of a high voltage state and a low voltage state over time corresponding to variations in the stuttered dial tone;

(c) means for, in response to each transition of a plurality of voltage transitions between the high voltage state and the low voltage state, incrementing a counter; and

(d) means for, if the counter is incremented to an appropriate number during a period of time, responding that the stuttered dial tone is present.

21. The method of claim 4 wherein the step of detecting whether the stuttered dial tone is present includes the sub-steps of:

(a) sensing on the line a voltage over time;

(b) converting the voltage over time, if a stuttered dial tone is present, to a high-low cadence of a high voltage state and a low voltage state over time corresponding to variations in the stuttered dial tone;

(c) in response to each transition of a plurality of voltage transitions between the high voltage state and the low voltage state, incrementing a counter; and

(d) if the counter is incremented to an appropriate number during a period of time, responding that the stuttered dial tone is present.

22. The device of claim 5 wherein the detection means further comprises:

(a) means for sensing on the line a voltage over time;

(b) means for converting the voltage over time, if a message waiting signal is present, to a high-low cadence of a high voltage state and a low voltage state over time corresponding to variations in the message waiting signal;

(c) means for, in response to each transition of a plurality of voltage transitions between the high voltage state and the low voltage state, incrementing a counter; and

(d) means for, if the counter is incremented to an appropriate number during a period of time, responding that the message waiting signal is present.

23. The method of claim 8 wherein the step of detecting whether the message waiting signal is present includes the sub-steps of:

(a) sensing on the line a voltage over time;

(b) converting the voltage over time, if a message waiting signal is present, to a high-low cadence of a high voltage state and a low voltage state over time corresponding to variations in the signal;

(c) in response to each transition of a plurality of voltage transitions between the high voltage state and the low voltage state, incrementing a counter; and

(d) if the counter is incremented to an appropriate number during a period of time, responding that the message waiting signal is present.

24. The device of claim 14 wherein the detection circuit further comprises:

(a) a sensing circuit which senses on the line voltage over time;

(b) a converting circuit which converts the voltage over time, if a stuttered dial tone is present, to a high-low cadence of a high voltage state and a low voltage state over time corresponding to variations in the stuttered dial tone;

(c) a counter which increments in response to each transition of a plurality of voltage transitions between the high voltage state and the low voltage state; and

(d) a comparator which compares the counter value accumulated during a period of time to a stored number and, if the number is exceeded, responds that the stuttered dial tone is present.

25. The device of claim 20 wherein the off hook impedance makes the connection for approximately 1.75 seconds.

26. The method of claim 21 wherein the step of connecting the pair of conductors with an off hook impedance is performed for approximately 1.75 seconds.

27. The device of claim 22 wherein the means for establishing communications on the line establishes such communications for approximately 1.75 seconds.

28. The method of claim 23 wherein the step of establishing communication on the line establishes such communication for approximately 1.75 seconds.

29. The device of claim 24 wherein the hookswitch circuit makes a connection with the off hook impedance for approximately 1.75 seconds.

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