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(71) Applicant *(for all designated States except US)*: **TYCO SAFETY PRODUCTS CANADA LTD.** [CA/CA]; 3301 Langstaff Road, Concord, Ontario L4K 4L2 (CA).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **SHARMA, Raman, Kumar** [CA/CA]; 5 Wandering Trail, Toronto, Ontario M1X 1K6 (CA). **BOGARIN, Francisco** [MX/CA]; 5 Fisherville Road, Apartment 1805, North York, Ontario M2R 3B6 (CA).

(74) Agent: **SMART & BIGGAR**; ATTN: ZISCHKA, Matthew, 438 University Avenue, Suite 1500, Box 111, Toronto, Ontario M5G 2K8 (CA).

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[Continued on next page]

(54) Title: ALARM SYSTEM PROVIDING WIRELESS VOICE COMMUNICATION

(57) Abstract: An alarm system includes one or more audio stations, and an audio station network interface. The audio stations communicate wirelessly with the audio station network interface. The audio station network interface communicates with a monitoring center over a cellular network, to allow audio monitoring of the premises at the audio stations. The audio station network interface may be called by the monitoring center. Calls may optionally be placed by it in response to user interaction with one of the audio stations.

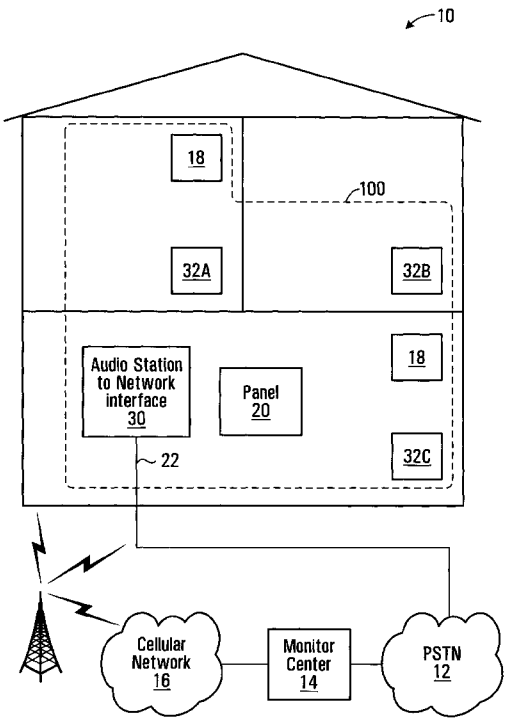

FIG. 1

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TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

ALARM SYSTEM PROVIDING WIRELESS VOICE COMMUNICATION

FIELD OF THE INVENTION

[0001] The present invention relates generally to alarm systems, and more particularly to alarm systems that allow voice communication with a monitoring center.

BACKGROUND OF THE INVENTION

[0002] Home and business alarms have become commonplace. Such alarms (often referred to as "security systems" or "alarm systems") typically include several sensors used to monitor unauthorized entry and other conditions at monitored premises, such as fire, smoke, toxic gases, high/low temperature (e.g. freezing) or flooding, at a premises. In response to sensing an alarm condition, one or more of these sensors provides a signal to an alarm panel that in turn may sound and notify the occurrence of the alarm to occupants of the premises and remotely signal a monitoring station or other third party.

[0003] Typically the occurrence of an alarm is signalled to a remote monitoring station that may then dispatch capable authorities to intervene at the premises. For example, in the case of sensing an unauthorized entry to the premises, the monitoring station may dispatch security personnel, typically in the form of private security guards or police officers.

[0004] In addition to monitoring and signalling certain alarm conditions, live voice communication with the monitored premises may be desirable. In this way, intruders may be scared off, and occupants may be guided or assisted. Live voice communication, however, typically requires a dedicated wired connection to a monitoring station, or prolonged use of the premises telephone line, preventing an occupant from calling others, such as the police, friends or relatives.

[0005] Further, conventional alarm systems that allow voice communication typically do so through a central panel, capable of otherwise signalling sensed alarms. As such, upgrading existing alarm systems typically requires the replacement of the panel.

[0006] Accordingly there is a need for alarm systems that allow voice communications with a monitoring center, possibly by way of addition or retrofit.

SUMMARY OF THE INVENTION

[0007] Exemplary of embodiments of the present invention, an alarm system includes one or more audio stations, and an audio station network interface. The audio stations communicate wirelessly with the audio station network interface. The audio station network interface communicates with a monitoring center over a cellular network, to allow audio monitoring of the premises at the audio stations. The audio station network interface may be called by the monitoring center. Calls may optionally be placed by it in response to user interaction with one of the audio stations.

[0008] In accordance with an aspect of the present invention, a method of processing an alarm at a premises, comprises: sensing the alarm at a premises; signalling the alarm from the premises to a monitoring center; from the monitoring center establishing a cellular network call to a network to audio monitoring station interface at a cellular network address, at the premises; establishing a radio channel from the network to audio monitoring station interface to at least one audio station at the premises, the audio station comprising at least one of speaker and a microphone, and bridging the radio channel to the cellular network call to establish an audio channel from the at least one audio interface to the monitoring center.

[0009] In accordance with another aspect of the present invention, an alarm system at a monitored premises, comprises: a control panel; a plurality of sensors in communication with the control panel, each of the sensors for sensing

a monitored alarm condition; a plurality of audio stations, each of the audio stations comprising at least one of a speaker and a microphone; and a radio transceiver; an audio station network interface, comprising a radio for communicating with a cellular communications network; and a radio transceiver for establishing a radio channel with at least one of the plurality of audio stations, the radio transceiver and the radio interconnected to bridge the radio channel to a call over the cellular communications network.

[0010] Other aspects and features of the present invention will become apparent to those of ordinary skill in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] In the figures which illustrate by way of example only, embodiments of the present invention,

[0012] **FIG. 1** is a schematic diagram of an alarm system at a monitored premises, exemplary of an embodiment of the present invention;

[0013] **FIG. 2** is a schematic block diagram of an alarm panel of the system of **FIG. 1**;

[0014] **FIG. 3** is a schematic block diagram of an audio station of the alarm system of **FIG. 1**; and

[0015] **FIG. 4** is a schematic block diagram of an audio station network interface of the alarm system of **FIG. 1**;

DETAILED DESCRIPTION

[0016] **FIG. 1** depicts a residential or business premises **10** guarded by an alarm system **100** including panel **20** in communication with a plurality of sensors

18. Panel **20** of **FIG. 1** is schematically depicted in **FIG. 2**.

[0017] Sensors **18** may be entry sensors, flood sensors, motion detectors, smoke detectors, glass breakage sensors, or any other sensors to be monitored, as appreciated by those of ordinary skill. Sensors **18** may also include user interface sensors/panels. Sensors **18** may be in communication with panel **20**, wirelessly, by a wired interconnect, through the electric wiring of premises **10**, or otherwise. The alarm system may further include other interfaces such as key pads, sirens, and the like, not specifically illustrated in **FIG. 1**.

[0018] Panel **20** is further interconnected with a conventional telephone network. In the depicted embodiment, panel **20** is interconnected with the public switched telephone network (the PSTN) **12** and may be in communication with one or more other communication network(s), through a network interface module **28**. Alternatively, or additionally panel **20** may be interconnected with network **16** in the form of a cellular telephone network that carries both voice and data. Cellular network **16** may, for example, be a GPRS/GSM cellular network, and as such be considered a GSM network and GPRS network. As will become apparent, panel **20** could instead or additionally be in communication with some other network such as a wide area wireless data network, a wired data network such as the internet, or the like.

[0019] A monitoring center **14** is in communication with PSTN **12** and cellular network **16**. Monitoring center **14** is depicted as a single monitoring center in **FIG. 1**. Monitoring center **14** could be formed of multiple monitoring stations, each at different physical locations. For example, some monitoring stations could be in communication with network **16**, others with in communication with PSTN **12**. Monitoring center **14** is associated with a plurality of PSTN telephone numbers, and optionally other network addresses, such as a cellular network or data address, that may be used to contact monitoring center **14** to provide data indicative of a monitored event, at a monitored alarm system, such as the alarm system including panel **20** at premises **10**. Typically, monitoring center **14** is manned with personnel, equipped to respond to a signalled alarm and able to dispatch emergency personnel, such as security personnel, the police, fire

department or the like.

[0020] Exemplary of an embodiment of the present invention, alarm system **100**, further includes a plurality of audio stations **32a**, **32b**, **32c** ... (individually, and collectively audio station(s) **32**) and an audio station network interface **30**. In the depicted embodiment, audio stations **32** are each wirelessly in communication with audio station network interface **30**, over a uni-, or bi-directional radio channel. Audio stations **32** may be placed throughout premises **10**, at locations convenient to occupants at premises **10**. As will become apparent, audio station network interface **30** bridges the one or more radio channels of audio station network interface **30** to a monitoring station to allow voice communication from a monitoring center, such as monitoring center **14**, to premises **10** in case of an alarm, or otherwise, over cellular network **16**.

[0021] Example alarm panel **20** is more particularly illustrated in **FIG. 2**. As illustrated, alarm panel **20** includes a central processor **34** in communication with memory **24** and a sensor interface **26**. A network interface **28** is further in communication with processor **34**. Network interface **28** is interconnected with telephone feed for the remainder of premises **10** and provides an output at tip and ring lines of network interface **28**. For example, tip and ring lines are typically suited for interconnection with PSTN **12**. However, tip and ring lines of interface **28** could feed a network interface module that is in communication with several networks including PSTN **12** and cellular network **16**, as for example detailed in U.S. Patent Application No. 11/728,478, the contents of which are hereby incorporated by reference. Software controlling overall operation of panel **20**, and hence system **100** may be loaded in memory **24**. Sensor interface **26** may communicate with sensors **18** by wires, wirelessly, over electrical wiring, or otherwise. Panel **20** may further include conventional components (not shown), such as a power supply, antennal, and the like.

[0022] An example audio station **32** is schematically depicted in **FIG 3**. As illustrated audio station **32** includes one or more audio transducers – in the form of a speaker **42** and a microphone **44**, interconnected with a radio transceiver **46**. Radio transceiver **46** may take the form of a conventional cordless

telephone transceiver, and may for example take the form of a spread-spectrum radio transceiver operating at 900 MHz, 2.4 GHz; 5.8 GHz; or the like. Radio transceiver **46** may for example be formed as a single integrated circuit available from Broadcomm, Texas Instruments and Freescale or others. Radio transceiver **46** may be addressable and operate on a unique frequency, allowing concurrent operation of multiple radio transceivers (and thus multiple audio stations **32**). Audio station **32** may also include a switch **38**, that may be actuated by an occupant to activate radio transceiver **46**. Once activated, radio transceiver **46** may attempt to establish a radio channel to a complementary transceiver (detailed below). Audio station **32** may further include conventional components (not shown), such as a power supply (in the form of an AC power supply, battery, or the like), an antenna, and the like.

[0023] As well, radio transceiver **46** may include control logic to receive and respond to a unique radio control signal, that once received may cause radio transceiver **46** to activate speaker **42** and microphone **44** and establish a link to a complementary transceiver. Alternatively, radio transceiver **46** may also include control logic to activate a coder/decoder (codec) which in turn may activate speaker **42** and microphone **44**.

[0024] Example audio station network interface **30** is schematically depicted in **FIG 4**. As illustrated, audio station network interface **30** includes a cellular network transceiver **52** – for example in the form of a conventional GSM or CDMA cellular network radio transceiver, able to establish and receive conventional cellular network calls over cellular telephone network **16** (**FIG. 1**). Optionally, cellular network transceiver **52** is further capable of receiving and transmitting cellular network data. To this end, cellular network transceiver **52** may be a combined GSM/GPRS radio transceiver, a CDMA 1x transceiver, or the like. Cellular network transceiver **52** may be formed as a single integrated be circuit or module, as for example made available by Motorola in the form of G24E GSM/GPRS module. Transceiver **52** accordingly is addressable over cellular network **16**, by way of its own telephone number, International Mobile Equipment Identity (IMEI), or similar network identifier. Control logic **54** of cellular network transceiver **52** provides control signals in response to receiving an

incoming cellular network call, or received digital data over network **16**. Again, audio station network interface **30** may further include conventional components (not shown), such as a power supply, antennal, and the like.

[0025] Audio station network interface **30** also includes a local radio transceiver **56**, complementary to radio transceiver **46** of each audio station **32**. Radio transceiver **46/56** may be similar to a radio such as the CC2511 offered by Texas Instruments. Radio transceiver **46/56** may also include control logic in the form of a microcontroller, such as a Freescale MC9S08GT16. Radio transceiver **56** may establish a radio channel local within premises **10** and provide and receive audio signals to transceiver **46** of each of audio stations **32**. Conveniently, local radio transceiver **56** may establish multiple independent radio channels – one to each of the multiple audio transceivers **46** at premises **10** - concurrently. Control signals from control logic **54** may cause radio transceiver **56** to selectively address and establish radio links to audio stations **32**. For example, suitable GPRS network control signal(s) from monitoring center **14** to network to audio station **30** may cause audio station to network interface **30** to activate one or more of audio stations **32**. Any suitable addressing technique from radio transceiver 56 to any one of transceiver **46** may be used.

[0026] Audio signals from wireless radio transceiver **56** may be provided to cellular radio transceiver **52** and thus to cellular network **16**, over a conventional cellular network voice call. Similarly, audio signals from network **16** may be provided from transceiver **52** to cordless radio transceiver **56**, and thus to individual audio stations **32**. In this way, one or two way voice calls from monitoring center **14** may be bridged to radio channels to audio stations **32** at audio station network interface **30** (i.e. from network **16** to audio station network interface **30**, to cordless radio transceiver **56**, to radio transceiver **46** of each audio station **32**). In this way, monitoring center **14** may establish a uni- or bi-directional audio channel with premises **10**.

[0027] In operation, sensors **18** and panel **20** interact in a conventional manner. As a particular sensor **18** is tripped signifying a sensed condition, the

sensor provides a signal, wirelessly or through wired interconnect, to panel **20**. Panel **20**, in turn, places a network communication, typically in the form of a call, to a pre-programmed telephone number to contact monitoring center **14**, typically by way of PSTN **12**.

[0028] In order to ensure that panel **20** has unfettered access to PSTN **12**, the wired telephone feed, providing telephone signals to the remainder of premises **10**, may be routed through panel **20**. This feed may be selectively disconnected from PSTN **12** by for example, a relay or the like, as panel **20** originates a call.

[0029] Software controlling the operation of central processor **32**, and hence panel **20**, may be embedded in processor **32** or may be stored in memory **24** external to processor **32**. This software may be conventional, and may control overall operation of panel **20**, including its interaction with sensors **18** and/or a control panel, for access and control. More specifically, the software causes alarm panel **20**, through interface **28** to place one or more outgoing telephone calls after detection of an alarm event. Prior to placing the outgoing call, interface **28** may disconnect telephone feed **22** from PSTN **12**. Typically, the alarm event represents the tripping of one of sensors **18** when alarm panel **20** is in its armed state.

[0030] The outgoing telephone call or calls may be placed to monitoring center **14**, or any other alternate number (such as a subscriber number) by dialling a stored PSTN telephone number. The PSTN telephone number(s) to be called (e.g. the number of monitoring center **14**) may be pre-programmed by an administrator of panel **20**, and also stored within memory **24**. Different sensed conditions may be associated with different PSTN number(s), thereby allowing different sensed conditions to be signalled to different monitoring stations, alternate numbers, or the like.

[0031] Once a pre-programmed number has been called, processor **32** generates a suitable message to the recipient. For example, if the called numbed is a monitoring center (such as monitoring center **14**), data representative of the sensed alarm may be generated, encapsulated, and

passed to monitoring center **14**. The data, for example, may be encapsulated using any one of a number of modulation techniques. For example, the data may be passed to the monitoring center as a series of dual-tone, muli-frequency ("DTMF") tones using, for example, the SIA Protocol (as specified in the ANSI SIA DC-**03-1990.01** Standard, the contents of which are hereby incorporated by reference), the ContactID Protocol, or as modulated data, modulated as pulses, or on a carrier frequency. If the number called is a subscriber number, processor **32** may generate a voice message to be heard by the subscriber.

[0032] Once an alarm has been signalled, monitoring center **14** may dispatch personnel or the police to premises **10**. Data stored at monitoring center may identify the address of premises **10**. Monitoring center **14** may further place a call to one or more designated telephone numbers (also stored at monitoring center **14**) to notify the owner of premises **10** (or his/her designee) of the sensed alarm condition.

[0033] Additionally, and in manners, exemplary of embodiments of the present invention, monitoring center **14** may initiate a cellular network call over cellular network **16** to audio station **32** by way of audio station network interface **30** of the alarm system at premises **10** that has signalled the alarm. Again, the cellular network address of audio station network interface **30** may be stored at monitoring center **14**. Prior to establishing the call (or thereafter) monitoring center **14** may further provide data to interface **30** to control radio transceiver **56**, to selectively communicate with ones of audio station(s) **32**, causing selected audio stations **32** to establish a radio channel with interface **30**, which may be bridged by audio station network interface **30** to monitoring center **14**. As noted, the radio channels may be uni-or bi-directional with speaker **42** and microphone **44**. Thus, at premises **10**, a one or two way voice channel between selected ones of audio interfaces **32** and monitoring center **14** may be established, by way of audio station network interface.

[0034] Conveniently, monitoring center **14** may thus communicate with a resident at premise **10**, or with an intruder at the premises through audio station(s) **32**. The resident/or intruders voice may be heard and recorded at

monitoring center **14**. As well, specific questions may asked of the resident and/or intruder, and voice warnings may be given.

[0035] Optionally, an occupant at premises **10** could initiate voice communication with center **14**, simply by actuating a switch **38** at any of any of audio station(s) **32**. Audio station **32**, in turn, signals audio station network interface **30** to establish a radio channel with the interface originating the signal. Control logic **54** may be sufficiently programmable to cause audio station network interface **30** to establish an outgoing cellular network call to a pre-determined number, identifying monitoring center **14**. Once the call has been placed, the radio channel to the audio station **32** and the call may be bridged at interface **40**, allowing the occupant to establish voice communication with monitoring center **14**. Prior to bridging the radio channel, data identifying the origin of the call may be provided to monitoring center **14**.

[0036] Conveniently, audio station interface **30** and audio stations **32** need not be physically interconnected with panel **20**. They may thus be added to an already existing alarm system at premises **10**. In this way, the existing alarm system need not be re-wired, or replaced. Further, as network to audio station interface **30** uses cellular network **16**, a voice connection between monitoring center **14** and audio station(s) **32** may be initiated at center **14**, or at audio stations **32**, and need not tie-up PSTN **12**, allowing an occupant to make an outgoing telephone call over PSTN **12**, after the alarm has been signalled.

[0037] In alternate embodiments, audio station interface **30** may be integrated with, or interconnected to panel **20**. Upon sensing an alarm condition, panel **20** may signal audio station interface **30** to initiate a call to monitoring center **14** and activate one or more of audio stations **32**.

[0038] In another embodiment, audio station **32** may be integrated with the alarm panel **20**. A further audio station interface **30** may be remote from panel **20**. Audio station **32** may communicate with audio station interface **30** as described above, or with PSTN **12** network interface **28** of panel **20**, to establish voice communication over PSTN **12**. Upon sensing an alarm condition, alarm panel **20** may choose to communicate the alarm condition to monitoring center

14 via the PSTN connected to panel **14**, or through the audio station interface **30**, by way of radio transceiver **32** in audio station **32** at panel **20**. Monitoring center **14** may then choose to initiate audio communication via PSTN, by placing a call to audio station interface **30**.

[0039] Of course, the above described embodiments are intended to be illustrative only and in no way limiting. The described embodiments of carrying out the invention are susceptible to many modifications of form, arrangement of parts, details and order of operation. The invention, rather, is intended to encompass all such modification within its scope, as defined by the claims.

WHAT IS CLAIMED IS:

1. A method of processing an alarm at a premises, the method comprising:

   sensing said alarm at a premises;

   signalling said alarm from said premises to a monitoring center;

   from the monitoring center establishing a cellular network call to a network to audio monitoring station interface at a cellular network address, at the premises;

   establishing a radio channel from said network to audio monitoring station interface to at least one audio station at the premises, said audio station comprising at least one of speaker and a microphone, and bridging said radio channel to said cellular network call to establish an audio channel from said at least one audio interface to said monitoring center.

2. The method of claim 1, further comprising selectively establishing said radio channel from said network audio interface to a selected one of a plurality of audio monitoring stations at the premises.

3. The method of claim 1, further comprising providing a control signal from said monitoring station to said network to audio monitoring station to activate said at least one audio station.

4. The method of claim 1, wherein said cellular network comprises a GSM network.

5. The method of claim 3, wherein said control signal comprises a GPRS data signal.

6. An alarm system at a monitored premises, comprising:

   a control panel;

   a plurality of sensors in communication with said control panel, each of

said sensors for sensing a monitored alarm condition;

a plurality of audio stations, each of said audio stations comprising at least one of a speaker and a microphone; and a radio transceiver;

an audio station network interface, comprising a radio for communicating with a cellular communications network; and a radio transceiver for establishing a radio channel with at least one of said plurality of audio stations, said radio transceiver and said radio interconnected to bridge said radio channel to a call over said cellular communications network.

7. The alarm system of claim 6, wherein said audio station network interface further comprises control logic to activate a selected one of said plurality of audio stations in response to commands received over said cellular communications network.

8. The alarm system of claim 6, wherein said audio station network interface is operable to receive cellular network calls over said cellular communications network.

9. The alarm system of claim 8, wherein said radio transceiver of each of said plurality of audio stations comprises a spread spectrum radio transceiver.

10. The alarm system of claim 8, wherein said radio comprises a GSM network radio.

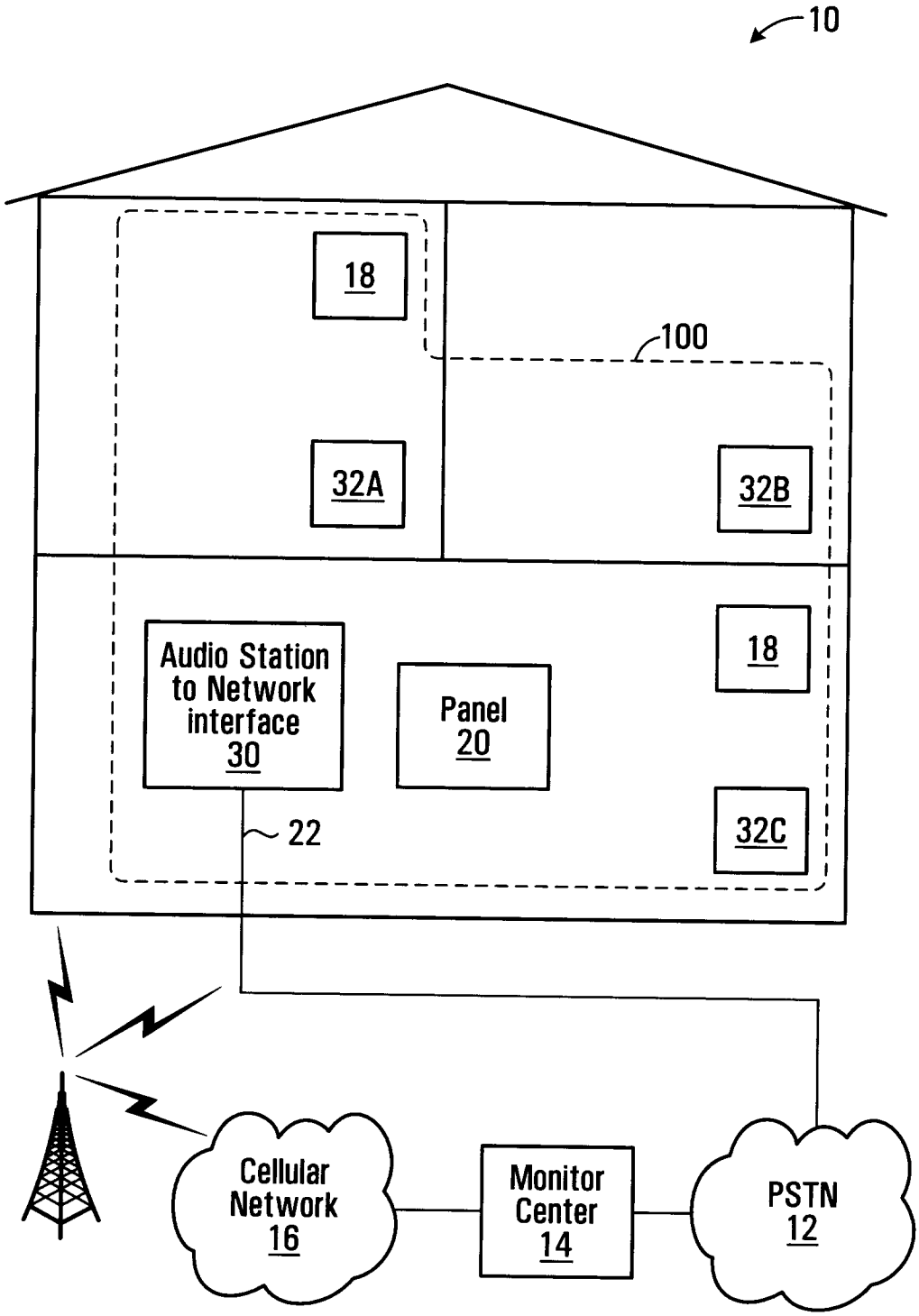

10
18
100
32A
32B
Audio Station to Network interface 30
Panel 20
18
22
32C
Cellular Network 16
Monitor Center 14
PSTN 12

FIG. 1

FIG. 2

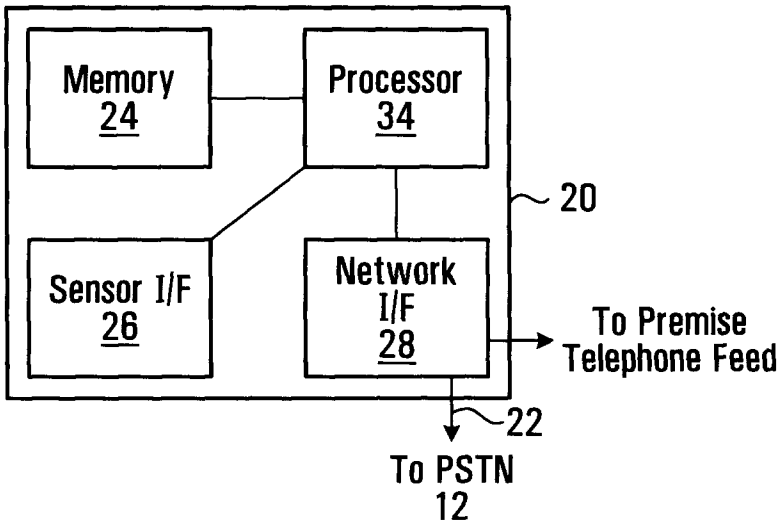


FIG. 3

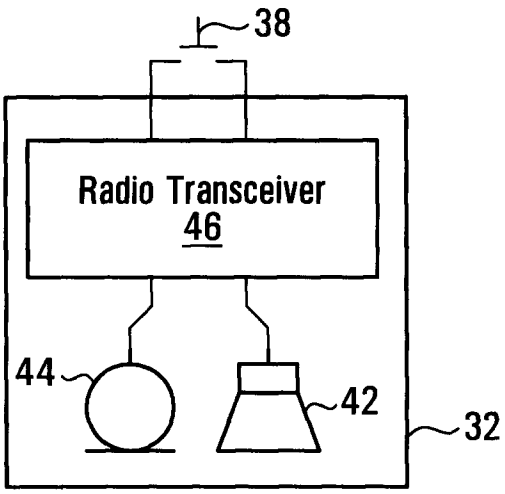
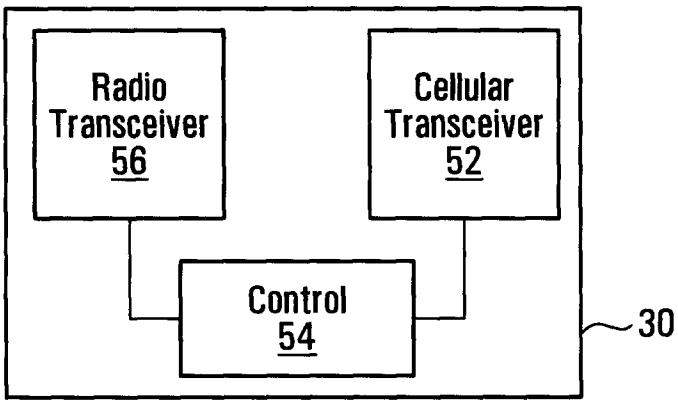


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2009/000942

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***G08B 25/10*** (2006.01) , ***H04W 4/00*** (2009.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC (2006.01): G08B, H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Delphion, US Patent Office Database (WEST), Canadian Patent Office Database, World Wide Web, Espacenet.
Keywords: alarm, monitor*, cellular, GSM, network, radio, audio, interface, premise, channel.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 00/75900 A1 (Kligman et al.), 14 December 2000 (14-12-2000) *See Abstract, Page 4 line 14 - Page 5 line 3, Page 6 lines 20-29, Figures 1a, 1b, 2	1-10
A	US 4 868 859 (Sheffer), 19 September 1989 (19-09-1989) *See whole document	1-10
A	US 5 517 547 (Ladha et al.), 14 May 1996 (14-05-1996) *See whole document	1-10
A	US 5 850 180 (Hess), 15 December 1998 (15-12-1998) *See whole document	1-10

[ ] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 July 2009 (30-07-2009)	20 October 2009 (20-10-2009)

Name and mailing address of the ISA/CA	Authorized officer
Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	Sajith Bandaranayake 819- 934-6754

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2009/000942

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
WO 0075900A1	14-12-2000	AT 278999T	15-10-2004
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