United States Patent

Curtin

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[54] ULTRASONIC PAGING SYSTEM

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[51] **Int. Cl.** **G08b 1/02**

[58] **Field of Search**.....340/216, 416, 224, 311, 312; 325/64, 55, 361; 179/2.5

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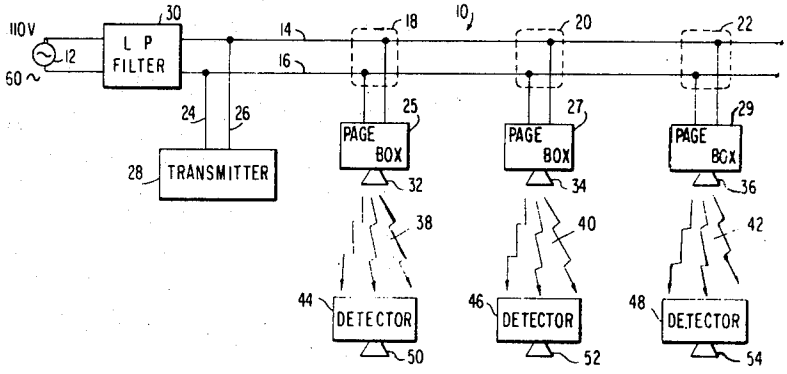
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[57] **ABSTRACT**

A system for paging or calling persons without disturbing anyone other than the person or persons being paged. A transmitter applies an electrical signal to a power line at a predetermined ultrasonic frequency indicative of the person sought. The power line is connected to a plurality of power outlets into which are plugged transducers which convert the electrical signal into an ultrasonic signal at the same frequency. The ultrasonic signal is broadcast from a speaker at each transducer and detected by the person carrying an ultrasonic detector responsive to that frequency.

12 Claims, 4 Drawing Figures



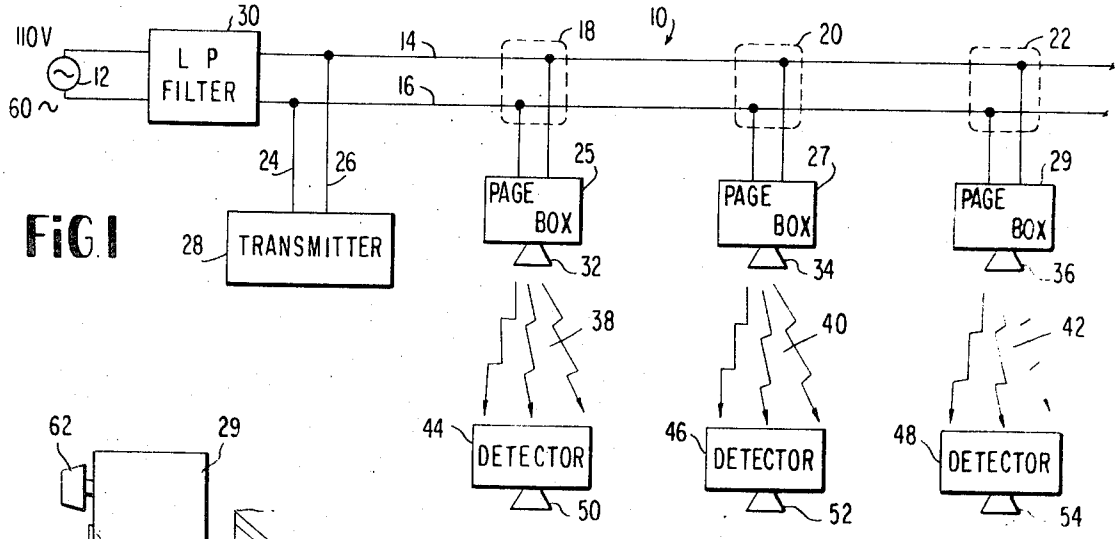


FIG. 1

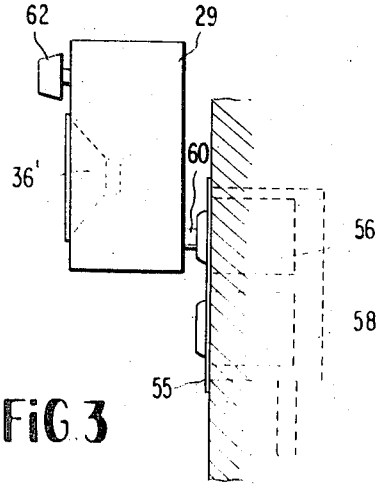


FIG. 3

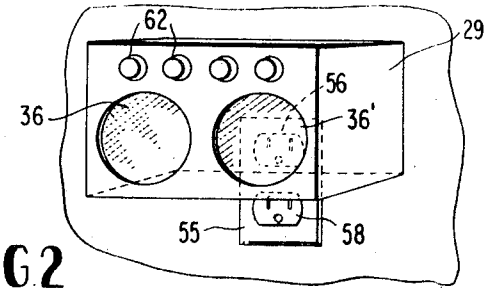
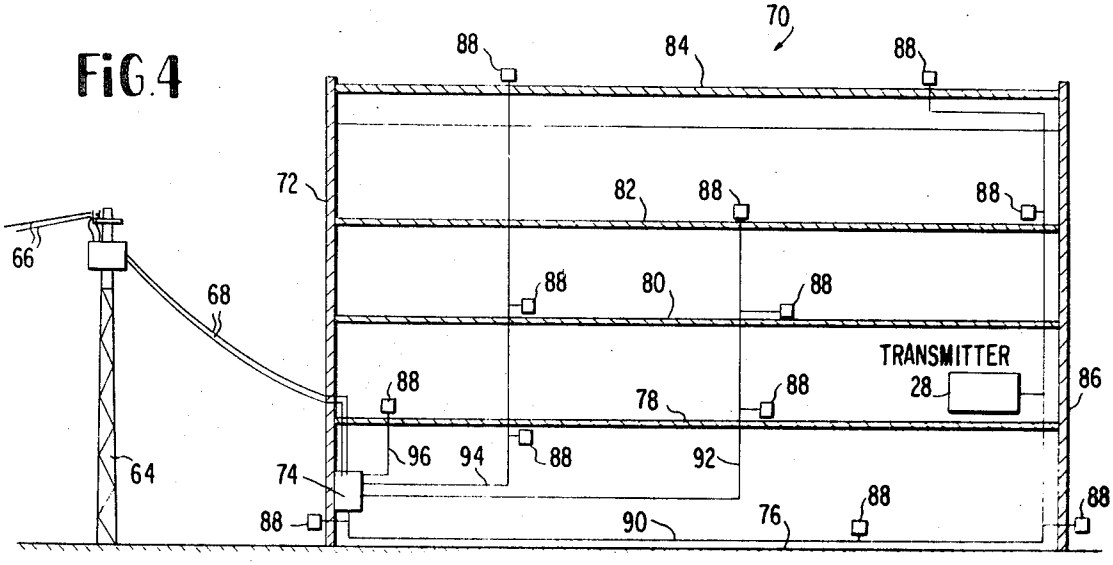


FIG. 2

FIG. 4



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ATTORNEYS

ULTRASONIC PAGING SYSTEM

This invention relates to a system for paging or calling individual persons from a group without disturbing the remainder of the group and more particularly is directed to such a paging system which requires a minimum modification of existing equipment so as to be relatively simple and inexpensive to install and operate. The system of the present invention is particularly adapted for "in-plant" use, such as for paging individual members of a hospital staff and for use in clinics, manufacturing plants, office buildings, and the like, including parking lots and yards.

As is well known, paging systems very often take the form of a plurality of loudspeakers spaced throughout the building or area in which the person sought is expected to be found. The person's name or other identifying data customarily is broadcast simultaneously over all of the speakers in the hopes that the person sought will be in sufficient proximity to one of the speakers so as to hear it, recognize his name, and take appropriate action to respond to the person seeking him. In many establishments, and in particular in hospitals where doctors and other staff personnel are frequently being sought, the frequent broadcasts over the loudspeaker system can be annoying and distracting, especially to patients who may be in need of rest.

The present invention avoids this difficulty by providing a paging system in which a plurality of loudspeakers broadcast ultrasonic vibrations or "silent sound" so as not to disturb or annoy persons within the broadcast range of the speakers other than the person or persons being paged.

An important feature of the present invention resides in the fact that it utilizes the conventional electrical 110 volt wiring of the building, such as a hospital or plant, as the electrical transmission media for the paging system. All that is basically required in the system is one or more page boxes which may be plugged into the conventional electrical outlet to broadcast the "silent sound" and a suitable detector carried by the person or persons wanted by the pager. The signal to be detected is transmitted from the originating point into the electrical wiring system of the building as an electrical wave in the ultrasonic frequency band. This wave is picked up by a unit plugged into any 110 volt outlet in the system. This is somewhat similar to a wireless intercom system whereby one person may communicate with another using the 110 volt wire as the communication path for the audio modulated ultrasonic frequency. The difference between a wireless intercom and the system of the present invention is that in a wireless intercom the ultrasonic frequency is detected and the audio modulation comes out of the speaker of the plugged in intercom device, whereas in the present invention the plugged in device or page box does not detect and rectify but instead picks up and amplifies the ultrasonic electrical frequency and instead of sending out audio acoustical energy into the adjacent area, it sends out or broadcasts ultrasonic acoustical energy into the room or area surrounding the speaker. This "silent sound" may be provided in any area desired by simply plugging in the page device to an electrical outlet of the building wiring system. The detector carried by the person or persons sought over the paging system may be in the form of a so-called "fat" device resembling a fountain pen which contains a battery, an audio amplifier, and an acoustic pickup. It should be provided with a selective feature, such as a filter or the like, and makes it possible for a person to be paged anywhere in the plant or on adjacent ground which may be supplied by electrical wiring outlets.

It is therefore one object of the present invention to provide an improved silent paging system.

Another object of the present invention is to provide an ultrasonic paging system of relatively simplified and inexpensive construction.

Another object of the present invention is to provide an ultrasonic paging system in which electrical signals at ultrasonic frequencies are transmitted over the conventional electrical wiring system of a building or other structure in which the paging system is installed.

Another object of the present invention is to provide an ultrasonic paging system in which so-called "silent sound" signals are broadcast from one or more page boxes plugged into the 110 volt outlets of a conventional building wiring system.

Another object of the present invention is to provide an ultrasonic paging system in which a signal is sent over a conventional electrical 110 volt wiring system at an ultrasonic frequency, this signal is received and converted in a page box to a corresponding ultrasonic sound signal and broadcast into an adjacent area by the page box, and detected by the person being sought through an audio detector to provide an audible, visual or other signal which may be sensed by the person carrying the detector to apprise him of the fact that he is being sought.

These and further objects and advantages of the invention will be more apparent upon reference to the following specification, claims, and appended drawings, wherein:

FIG. 1 is a block diagram of an overall ultrasonic paging system constructed in accordance with this invention;

FIG. 2 is a perspective view of a conventional wall outlet showing a page box plugged into one of the outlet sockets;

FIG. 3 is a side view of the outlet and page box of FIG. 2; and

FIG. 4 is a partially diagrammatic view of a building incorporating a paging system constructed in accordance with this invention.

Referring to the drawings, the paging system of the present invention is generally indicated at **10** in FIG. 1 and comprises a conventional 60 hertz 110 volt AC power supply or source **12** which may be a conventional electrical service line for supplying 110 volt electrical energy to a building, plant or similar edifice. An electrical signal from source **12** passes by way of a conventional building wiring system, exemplified by wires **14** and **16**, to a plurality of electrical outlets indicated by the dashed boxes **18**, **20**, and **22**. Coupled to the electrical network including leads **14** and **16** by way of leads **24** and **26** is an electrical transmitter **28**. By way of example only, transmitter **28** may take the form of a low frequency oscillator producing a sinusoidal electrical output on leads **24** and **26** at a frequency in the ultrasonic range, i.e., 25,000 hertz and higher. Transmitter **28** preferably comprises a variable frequency oscillator so that the output signal on leads **24** and **26** may be varied, preferably in steps, to produce signals having a frequency indicative of the person sought over the paging system **10**.

If necessary or desirable, the ultrasonic frequency signals from transmitter **28** may be prevented from interfering with source **12** by inserting a low pass filter **30** into the system between source **12** and transmitter **28**. In this way, the low frequency, i.e., 60 hertz signals, from source **12** may pass through filter **30** to the outlets **18**, **20**, and **22**, but the higher frequency electrical signal from transmitter **28** will not pass through the filter **30** to source **12**.

Plugged into each of the outlets **18**, **20**, and **22** is a page box as indicated generally at **25**, **27**, and **29**. Each of page boxes is preferably of identical construction and basically comprises a transducer for converting or transducing the electrical signal on leads **14** and **16** from transmitter **28** into a sound or pressure signal of the same shape and frequency. The page boxes are connected to respective speakers **32**, **34**, and **36** for broadcasting the "silent sound," i.e., the pressure or sound signals at ultrasonic frequency, into the air or atmosphere adjacent the speakers as indicated at **38**, **40**, and **42** in FIG. 1. Each of the page boxes **25**, **27**, and **29** preferably includes an electrical amplifier for amplifying the signal from the transmitter **28** before it is transduced or converted into a pressure or sound signal. The converter or transducer may be of any conventional construction, such as a well known piezo-electric device, capacitive transducer, or the like, for converting electrical signals into pressure or sound signals acting on the surrounding air. Speakers **32**, **34**, and **36** may be of conventional construction and serve to funnel or direct the pressure signals produced in the page boxes into the areas of a room, parking lot, hallway, or the like, which the respective outlet serves.

That is, the speakers **32**, **34**, and **36** act in the same manner for the ultrasonic waves as they would act for audible waves at a slightly lower frequency and broadcasts them so as to produce the ultrasonic waves indicated at **38**, **40**, and **42**.

These latter waves are picked up by respective detectors **44**, **46**, and **48**. Again, these detectors may be of conventional construction and, by way of example only, each may comprise a so-called "fat" device resembling a fountain pen which may be carried in the pocket of a person to be paged and which contains a battery, an audio amplifier, and an acoustic pickup, and which is preferably provided with a selection or coding means, such as a filter, peculiar to the person carrying the detector. The detectors are preferably connected to respective speakers **50**, **52**, and **54** for producing an audible signal in response to the impingement on the detector of ultrasonic waves of the proper frequency.

By way of example only, the transmitter may be set by the operator or sender of the paging signal at a predetermined ultrasonic frequency, which frequency is indicative of and peculiar to a particular person being sought who has been previously assigned that frequency. That is, the detector **44**, **46**, or **48** carried by the person being sought is preferably provided with a filter or other selection device which will pass the one particular frequency at which the transmitter **28** is set but which rejects all other frequency signals from the transmitter. In the example given, it is assumed that the transmitter **28** is set at a frequency for example of 25,000 hertz so that sound waves **38**, **40**, and **42** at the ultrasonic frequency of 25,000 hertz are transmitted from each of the boxes **25**, **27**, and **29** by way of speakers **32**, **34**, and **36**. This frequency is rejected by detectors **44** and **46** so that speakers **50** and **52** are not energized. However, the filter in detector **48** has been previously set to pass this frequency and an audible output is produced at speaker **54** of sufficient strength to apprise the carrier of the detector that he or she is being paged. It is apparent that in place of an audio output speaker **54**, the detector, as well as the other detectors, may be provided with an optical indicator, such as a light or other similar device. While three detectors **44**, **46**, and **48** are shown, it is understood that in normal operation many more detectors would be provided, i.e., one for each person who might be sought over the paging system. Similarly, the number of page boxes would be varied in accordance with the area to be covered and the number of available electrical outlets.

FIGS. **2** and **3** are front and side views, respectively, of a typical outlet, such as the outlet **22** of FIG. **1**. The outlet shown is in the form of a conventional wall outlet and includes the usual faceplate **55** through which pass receptacles **56** and **58** adapted to receive a conventional two or three prong plug. Plugged into the upper receptacle **56** by prongs **60**, as shown in FIG. **3**, is the page box **29**. In this embodiment, the page box is preferably provided with a pair of speakers **36** and **36'** for broadcasting the ultrasonic signals and with a plurality of control and adjustment knobs as indicated at **82**.

FIG. **4** is a partially diagrammatic view of a four-story building incorporating the novel paging system of the present invention. In FIG. **4**, an electric light pole **64** is illustrated as supporting electrical lines **66** which supply electrical energy over conventional service lines **68** to a building **70**. The surface lines pass through one of the walls **72** of the building and terminate at a service box **74**. The four-story building is provided with the four floors indicated diagrammatically at **76**, **78**, **80**, and **82** and with a roof **84**. On each of the floors, on the roof, and on the outside front and back walls **72** and **86**, respectively, are a plurality of conventional 110 volt outlets **88** corresponding to the outlets **18**, **20**, and **22** of FIG. **1**. Transmitter **28**, mounted in this example on the second floor **78**, is connected to all the outlets **88** by way of leads **90**, **92**, **94**, and **96** which are all connected together internally of the service box **74**. Service lines **68** are connected to these leads, preferably through an isolation device such as the low pass filter **30** of FIG. **1** which may also be located in or adjacent service box **74**. When the transmitter **28** is energized, an electrical signal at an ultrasonic frequency appears at each of the outlets **88**. With a paging box plugged into one or more of these outlets, the detector on the person being sought will give an audible or visual indication upon receipt of a signal at a predetermined frequency from transmitter **28**. It is understood that if desired other encoding arrangements may be utilized in place of the frequency spacing described.

It is apparent from the above that the present invention provides an improved "silent" or ultrasonic paging system which operates such that only the person being sought is interrupted or distracted by an audible or visual signal. An important feature of the present invention resides in the fact that it utilizes one or more page boxes which are plugged into conventional outlets of an existing or conventional 110 volt electrical wiring network and which boxes cooperate with a transmitter connected to the network to receive an electrical signal which is supplied from the transmitter via the electrical wires of the network. This ultrasonic electrical signal is converted or transduced in the page box and broadcast as a "silent" or pressure signal at the same ultrasonic frequency. The sound signal is detected by a suitable detector carried by the person being paged to produce a preferably audible sound signal apprising the carrier of the detector that he is being sought by the person operating the transmitter. In the preferred embodiment, the detectors are provided with bandpass filters which pass a particular ultrasonic frequency and reject all others so that the person being sought is identified by the frequency produced by transmitter **28** and each transmitter frequency is peculiar to a particular individual who may be paged by the system.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. An ultrasonic paging system comprising an electrical transmitter, a plurality of electrical outlets, wire network means coupling said transmitter to said outlets and transducer means for converting an electrical signal from said transmitter into a corresponding ultrasonic signal, said transducer means being plugged into at least one of said outlets.

2. A paging system according to claim **1** wherein said transducer means includes means for broadcasting said ultrasonic signal into the area adjacent said transducer means.

3. A paging system according to claim **2** wherein said broadcasting means includes a speaker.

4. A paging system according to claim **1** including at least one portable ultrasonic detector for detecting an ultrasonic signal from said transducer means.

5. A paging system according to claim **4** wherein said detector includes means for selectively detecting only certain ultrasonic signals from said transducer means.

6. A paging system according to claim **5** wherein said detector is frequency selective.

7. A paging system according to claim **1** wherein said wire network means is a power network for transmitting electrical power.

8. An ultrasonic paging system comprising an electrical transmitter for producing an electrical signal at ultrasonic frequencies, a plurality of electrical power outlets, power wire network means coupling said transmitter to said outlets, and transducer means for converting an ultrasonic frequency electrical signal from said transmitter into corresponding ultrasonic signal and broadcasting it into an adjacent area, said transducer means being plugged into one of said outlets.

9. A paging system according to claim **8** including an electrical power source coupled by said network means to said outlets.

10. A paging system according to claim 9 wherein said source comprises a conventional 110 volt 60 Hertz electrical source and said outlets include a plurality of conventional wall outlets.

11. A paging system according to claim 9 wherein said network means is the electrical power supply network of a building.

12. A paging system according to claim 11 wherein some of said outlets are inside said building and some are outside.

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