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Conroy et al.

[11] **3,829,856**

[45] **Aug. 13, 1974**

[54] **PAGING VISUAL SIGNAL**

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[73] Assignee: **The United States of America as represented by the Secretary of the Interior,** Washington, D.C.

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[52] **U.S. Cl.** ..... **340/366 R,** 340/311, 340/148

[51] **Int. Cl.** **G08b 5/38**

[58] **Field of Search** .... 340/311, 148, 366 R, 366 B; 179/84 L

[56] **References Cited**

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3,586,919 6/1971 Harris ..... 340/148 X

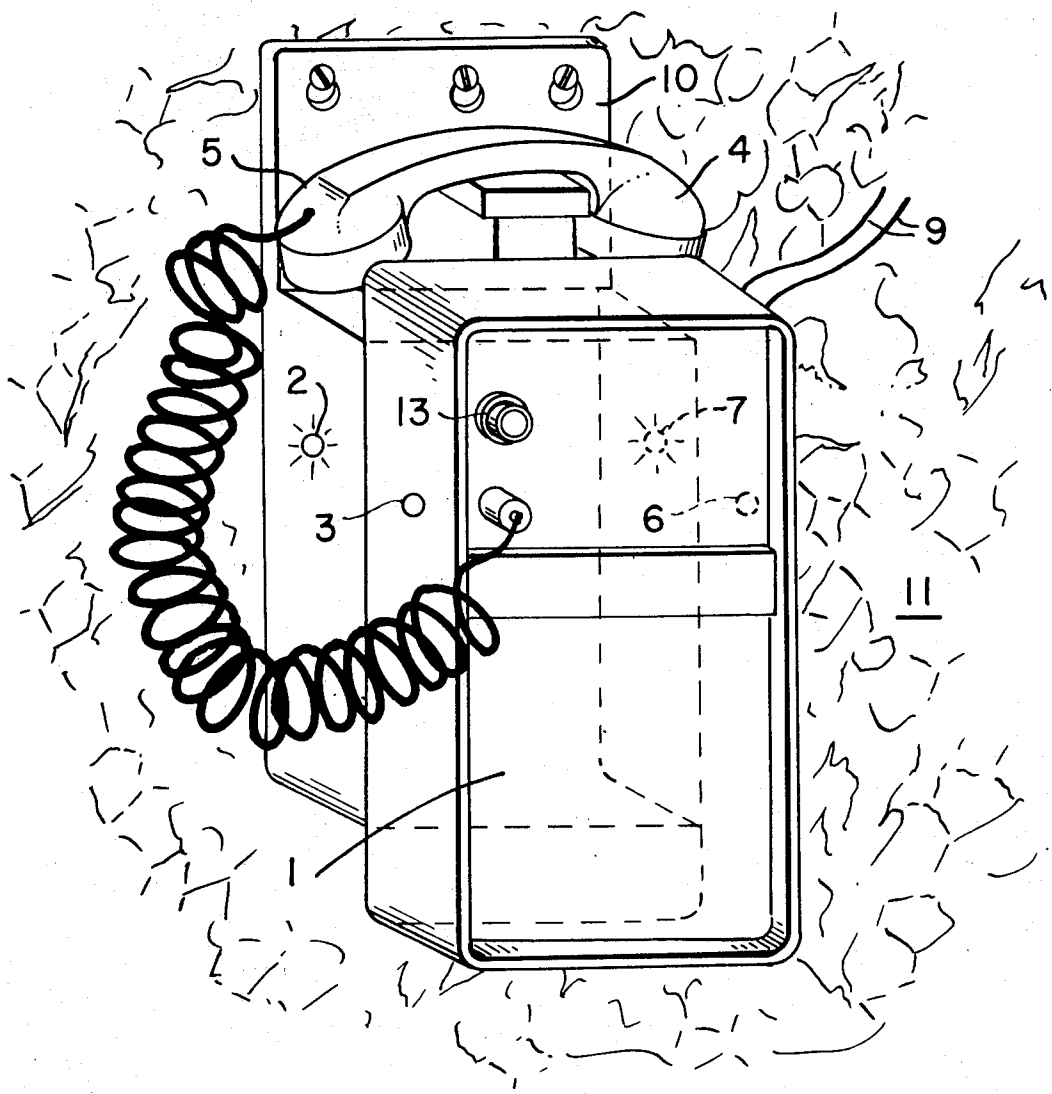
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[57] **ABSTRACT**

A telephone visual paging system that is actuated by an audio signal. The audio input current is used to power two or more light emitting diodes which are housed on a telephone receiver. Other than the audio signal power supply, no separate power supply system is needed to power these light sources. By superimposing variations caused by the audio input signal on the periodic switching signals from a multivibrator, the light emitting diodes can generate a semaphore radiation action to get the visual attention of an observer. This invention is particularly useful in hazardous gaseous environments, like coal mines, where electric wiring connections and the possibility of ignitions from electric sources should be minimized.

5 Claims, 2 Drawing Figures



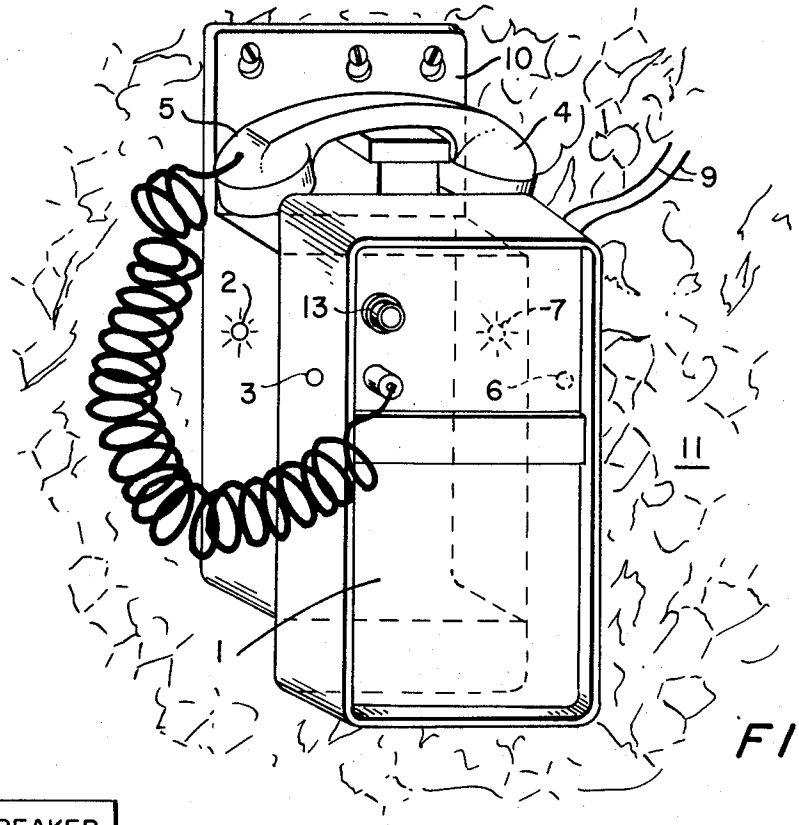

10
5
4
9
2
13
7
3
6
11
1

FIG. 1.

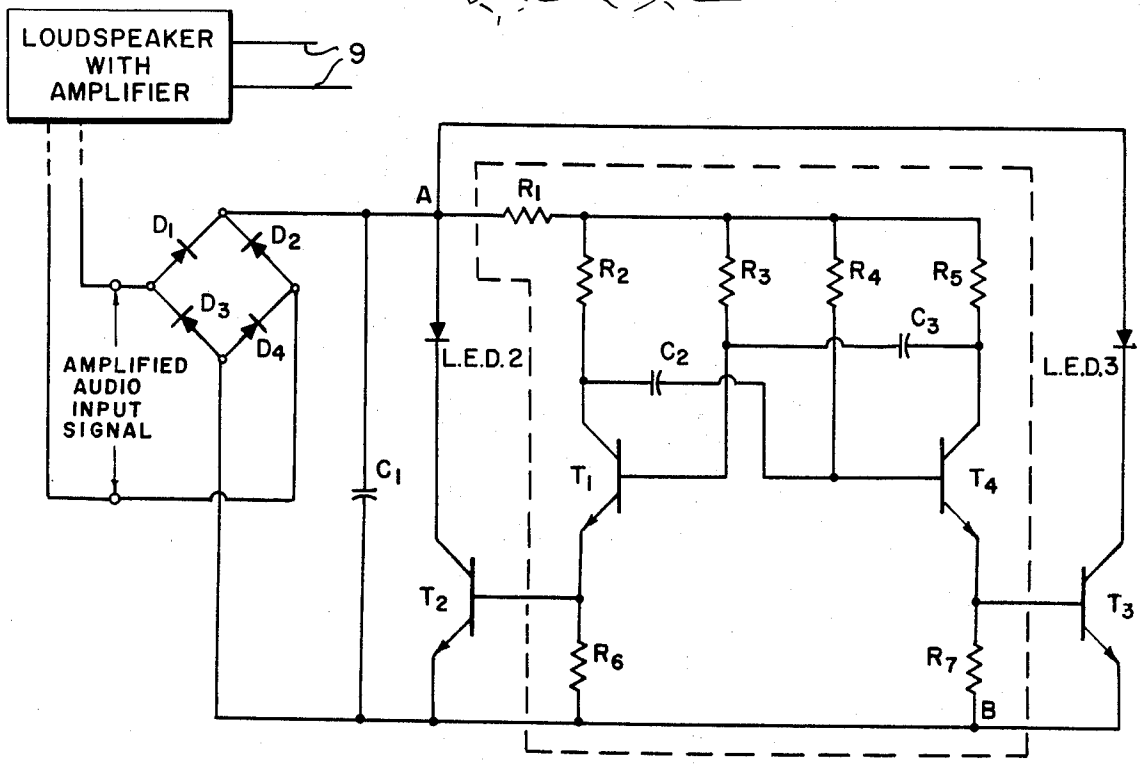

LOUDSPEAKER WITH AMPLIFIER
9
A
R1
D1
D2
D3
D4
R2
R3
R4
R5
C3
C2
L.E.D.2
L.E.D.3
AMPLIFIED AUDIO INPUT SIGNAL
C1
T1
T4
T2
T3
R6
R7
B

FIG. 2.

PAGING VISUAL SIGNAL

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a visual paging system which is actuated by an inputted audio signal from a remote speaker. It does this without using any separate power source for the paging system. The paging system visually transmits a semaphoric rhythm from the observable light sources.

2. Description of the Prior Art

In noisy environments where bells or other sound devices cannot be used, voice actuated lights have been used to alert observers that someone is trying to communicate with them on a telephone. Usually the intensity or frequency of the light source is varied as the speaker talks. An example of such a prior art reference is the U.S. Pat. No. 3,582,671 to James H. Ott. In all of the known prior art references, the power to actuate the light source is supplied from a power supply in the receiver in addition to the power source used to send the audio signal. To avoid the use of this separate power source for the paging light, we have invented a system that uses two or more light emitting diodes whose transmitted radiation variation is dependent on the combination of the signal from an audio amplifier and the switch action of a multivibrator.

By reducing the power sources needed to visually signal an observer in a noisy environment, which also has potentially hazardous gases, the number of points of possible ignition are also reduced. Thus, our invention is not only less costly to build, since it uses less parts, but it is also safer in many environments.

SUMMARY

The visual paging system we have invented consists of the following basic elements: Means to input an amplifier audio signal, circuitry to change the audio signal to a pulsating dc signal, two light emitting diodes, means to receive said pulsating signal, and a switching circuit to switch the pulsating signal from one diode to the other in a regular manner as the audio signal is superimposed thereon to usually give a semaphore effect at the light emitting diodes.

The primary object of this invention is an improved visual paging system.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a telephone receiver in a mine with our visual paging system attached.

FIG. **2** is a circuit diagram of the paging system.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. **1** illustrates the preferred embodiment of the system housed in a generally closed telephone receiver housing **1.** For descriptive purposes, this illustrated system will be referred to as the receiver system. An identical remote second system (not shown), into which the person who is initiating the paging speaks, is connected by wires to illustrated housing **1.** This remote second system will be referred to as the speaker system. Two light emitting diodes **2** and **3** (L.E.D.) may be placed in a side-by-side relationship on one side of the receiver housing or if both housing sides are visually observable, a second set of LEDs **6** and **7** may be added. When the pager initially speaks the name of the person into the

speaker system telephone, he simultaneously depresses a paging button, like button **13,** on the speaker telephone. This action causes the dc voltage to be sent via telephone wires **9** to an amplifier unit located in the receiver system. A loudspeaker unit, located in receiver housing **1,** is actuated by this amplifier and broadcasts the name spoken. At the same time this same signal is used to actuate the visual paging circuit shown in FIG. **2.** The telephone handset is then picked up by the individual answering the page and he may speak into the microphone end **5** and listen into end **4.** The receiver system of FIG. **1** can be held by a screw held bracket **10** to a mining wall **11.**

FIG. **2** illustrates the visual paging circuit components of the system all of which, except for the handset, are in receiver housing **1.** Wires **9** are connected to the input of the rectifier bridge formed by interconnected diodes D_1, D_2, D_3, and D_4. These same wires carry the audio signal from the high impedance side of the speaker system paging amplifier transformer (not shown) which is connected in parallel with the loudspeaker voice coil. An optional transformer may also be used to step up the impedance to the level required for proper operation if the output voltage to the loudspeaker is not sufficiently high.

The rectified bridge functions to convert the incoming dc audio signal to a pulsating dc signal. Capacitor C_1 smooths this converted signal out somewhat. The two LEDs which were designated by numbers **2** and **3** of FIG. **1** are designated, respectively, as LED **2** and LED **3** in FIG. **2.** Each LED has its associated biased based transistors T_2 and T_3 which receive the pulsating signal from the bridge if their associated transistor permits current flow. As is apparent from FIG. **2,** the base of transistors T_2 and T_3 are energized by the remaining circuitry which is depicted within the dotted lines of FIG. **2.**

The circuitry within the dotted lines having resistors R_1, R_2, R_3, R_4, R_5, R_6, and R_7, capacitors C_2 and C_3, and transistors T_1 and T_4 functions as an astable multivibrator. Like the rest of the FIG. **2** circuit, it is powered by the rectified and smoothed input audio signal. When in an operative state, a signal from the loudspeaker induced by a speaker actuates the circuitry to send regular pulsating signals to LED **2** and LED **3** which are superimposed upon the variable frequency output from the multivibrator. The result is a visually appealing semaphore action between the LEDs that catches the eye of an observer and which is intrinsically safe and yet consumes a lower power drain. The action is such that it alternately illuminates from LED **2** to LED **3** and back in a regular manner with variations in frequency of alternation depending on the intensity of audio signal input. This intensity is directly related to the intensity of the voice of the speaker. When nobody is speaking into the distant microphone, there is no illumination of either of the LEDs.

Various types and values may be given to each of the circuit elements. For example, in the preferred working embodiment, the following values were used: Resistor $R_1 = 300$ ohms, resistor $R_2 = 3.3K$ ohms, resistors R_3, R_4, and $R_5 = 22K$ ohms, resistors R_6 and $R_7 = 2.2K$ ohms, capacitors C_1 and $C_3 = 35\ \mu$ farads, capacitor $C_2 = 30\ \mu$ farads, transistors T_2 and T_3 = 2N1893 type manufactured by Motorola Corp., transistors T_1 and T_4 = 2N2540 type manufactured by Motorola or Texas Instruments, LED **2** and LED **3** are types MV10B manu-

factured by Monsanto and bridge rectifiers are D_1, D_2, D_3, and D_4 type 10DB2A manufactured by International Rectifier Corporation. Other variations of manufacturers, types, and values are, of course possible as long as the total system functions in a complementary manner as intended.

The two additional LEDs designated by numbers **6** and **7** in FIG. **1** are not essential to the invention, but are used only to show miners on the right hand side of the receiver (viewed in FIG. **1**) a person is calling. They could be incorporated into the FIG. **2** circuitry by adding two parallel legs each with one LED and one transistor connected in series, like LED **2** and transistor T_2, between the points A and B of FIG. **2**. The base of each of these two added transistors would join the multivibrator circuit between transistor T_1 and resistor R_6 and, for the other added leg, between transistor T_4 and resistor R_7.

It should be apparent that our invention accomplishes its intended stated objective. The circuitry described in FIG. **2** has no self-contained power source but acts rather as a passive unit until activated by an incoming audio signal. Thereafter, the LEDs pulsate at a frequency which is changed by the inputted audio signal to visually give the attention attracting semaphore effect. A delay in shut off is included to prevent the stopping of signalling between normal word interruptions or normal pauses in conversation. This delay is accomplished by capacitor C_1 which has initially stored sufficient energy. During short voice pauses, it discharges this stored energy until it is depleted, at which time, the visual paging signal ceases. Variations, of course, are possible. While not preferred, the multivibrator circuitry could be eliminated so that a variable frequency is emitted by LED which is dependent only on the audio input signal. However, the desired semaphore effect would be missing in such a modification.

Additional circuitry (not shown) allow the audio signal transmitted on wires **9** to be converted to sound when an observer picks up earpiece **4**. The semaphore optical radiation usually stops shortly thereafter when this happens, depending on the arrangement of the additional circuitry with the system illustrated.

None of the specifically disclosed circuit elements or their arrangement or any disclosed features should be used to limit the scope and extent of this invention which is to be measured only by the scope of the claims which follow.

We claim:

1. A visual paging system for attracting the attention of observers comprising:

means for inputting an amplified audio signal into the system;

circuitry to change the inputted audio signal to pulsating direct current signals;

a plurality of light emitting diodes operatively connected to said pulsating circuit; and

a switching circuit connected to said light emitting diodes such that in an operative state, it continuously switches the signals received by the light emitting diodes from the pulsating circuit when there is an audio input signal.

2. The system of claim **1** wherein at least two of said light emitting diodes are connected by parallel circuits to each other.

3. The system of claim **1** wherein said pulsating circuitry comprises a rectifier bridge circuit in parallel with a capacitor.

4. The system of claim **1** wherein said switching circuit comprises an astable multivibrator connected by solid state devices to each of said light emitting diodes.

5. The system of claim **1** wherein said system is contained in a single housing and said light emitting diodes consist of four diodes, two on opposite sides of said housing.

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