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Bird et al.

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[54] **PULSING BELL HAVING RECTIFIER CIRCUIT**

[75] Inventors: **Nicholas W. F. Bird; Chang-Whan Kim,** both of Owen Sound, Ontario, Canada

[73] Assignee: **General Signal Corporation,** Rochester, N.Y.

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[52] **U.S. Cl.** ..... **340/384 R,** 340/384 R

[51] **Int. Cl.** **G08b 3/10**

[58] **Field of Search** ..... 307/10 R, 106; 340/384 E, 340/384 R

[56] **References Cited**

UNITED STATES PATENTS

3,460,136	8/1959	Jambazian	340/384 E
3,618,079	11/1971	Denning	340/384 E

Primary Examiner—Harold I. Pitts

Attorney, Agent, or Firm—George W. Killian; Milton E. Kleinman; John F. Ohlandt

[57] **ABSTRACT**

A pulsing bell of the type which sounds intermittently so as to provide an emergency alarm indication. The pulsing bell includes an actuator circuit which is incorporated within the bell structure and is extremely simple in design. The actuator circuit is adapted to operate efficiently on a conventional AC power supply.

8 Claims, 2 Drawing Figures

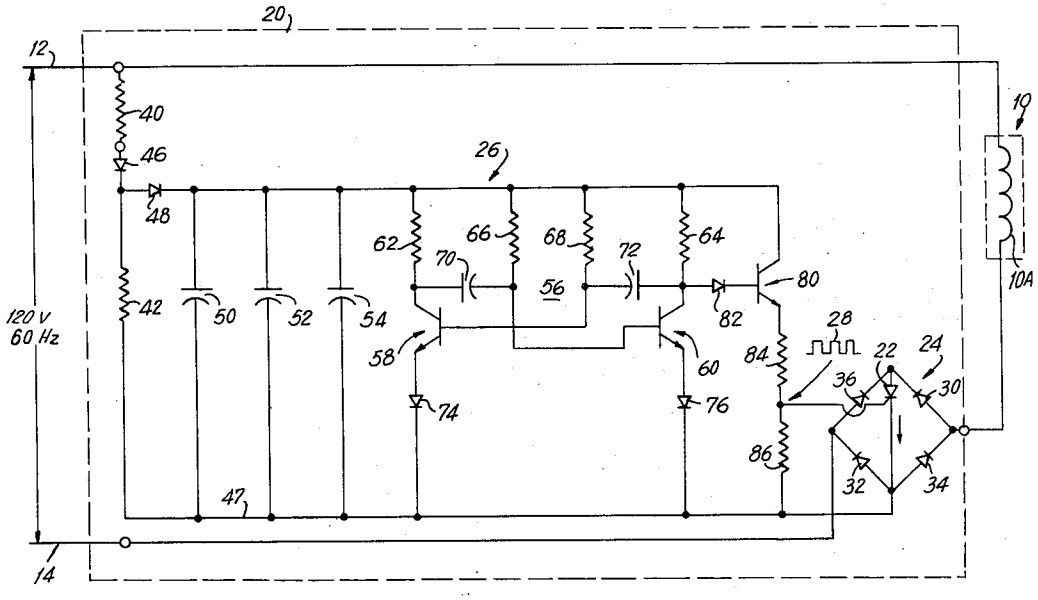


FIG. 1

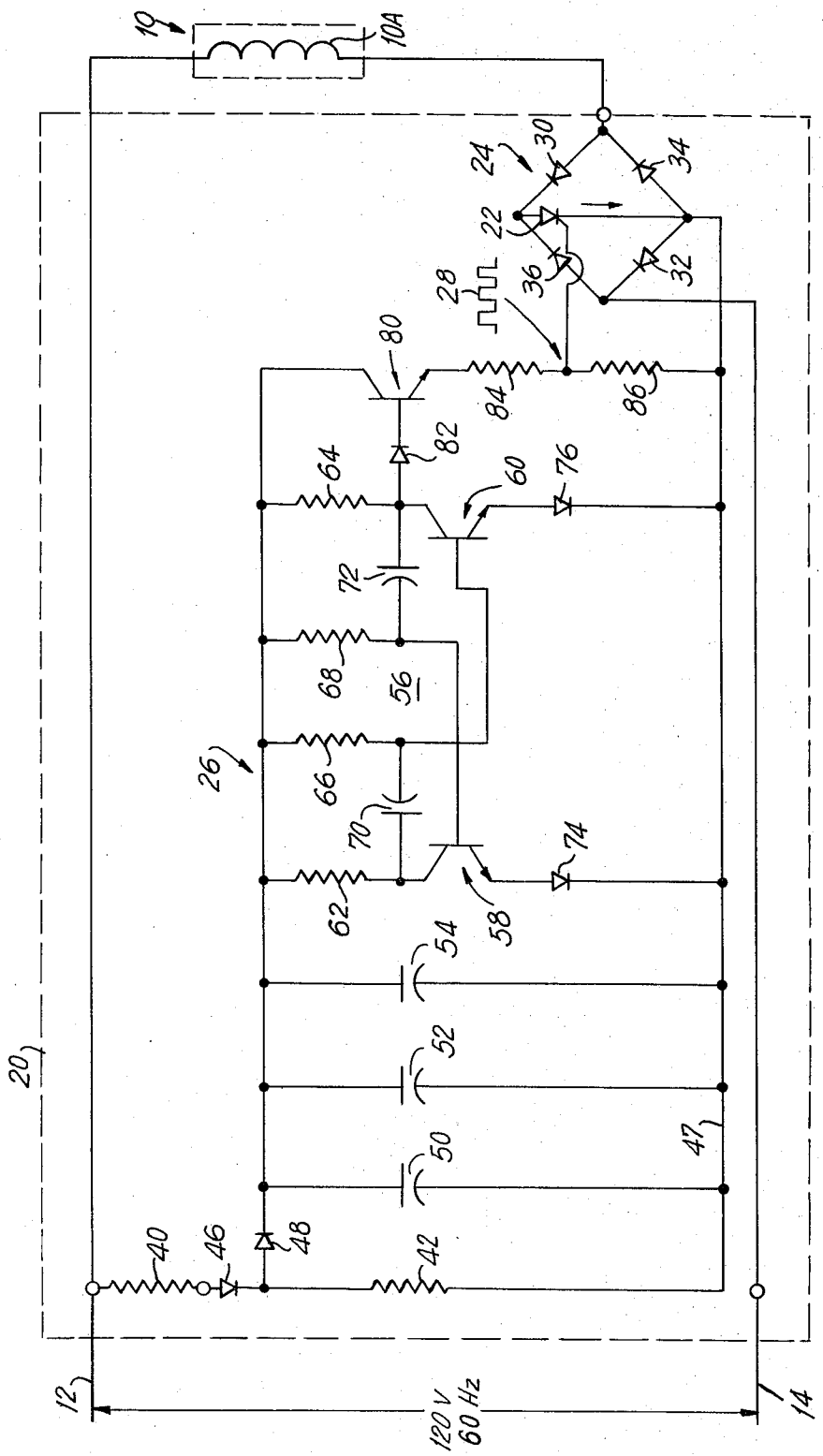
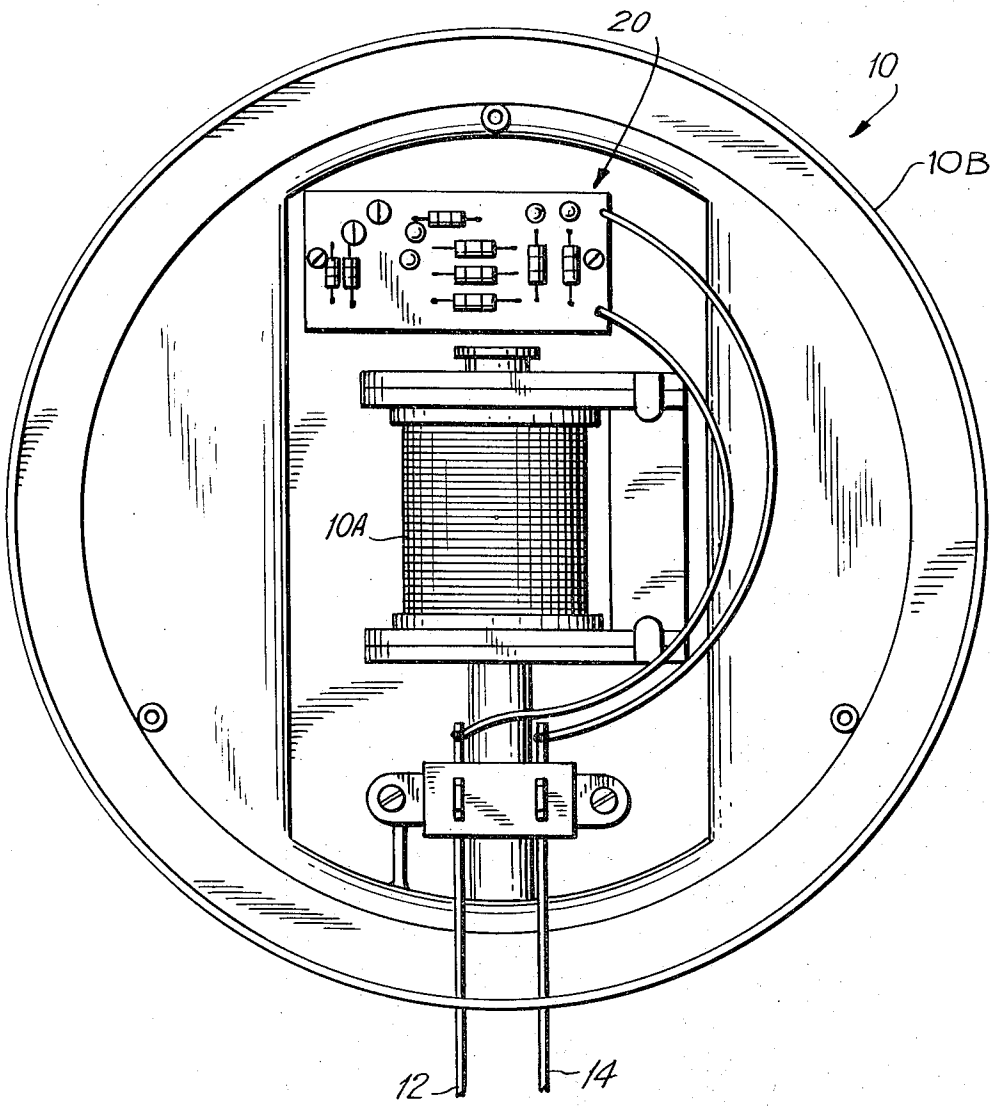

10
10A
12
14
20
22
24
26
28
30
32
34
36
40
42
46
47
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
80
82
84
86
120 V
60 Hz

FIG. 2



PULSING BELL HAVING RECTIFIER CIRCUIT

BACKGROUND, OBJECTS AND SUMMARY OF THE INVENTION

This invention relates to a device or system for producing an audible signal in response to an emergency condition and for providing such signal on an intermittent rather than a continuous basis.

It has become a common practice, and indeed is often part of equipment specifications, that certain kinds of emergency alarm indications must be provided on an intermittent basis. This is because it has been found that an intermittent signal is more effective, particularly where there is a high background noise level in the ambient where the emergency alarm indication is to be given.

An example of a system that has been known in the prior art for producing an intermittent signal is one described in U.S. Pat. No. 3,514,622 granted May 26, 1970. In this patent an actuator circuit is provided for a vehicle horn or the like and according to this arrangement, the power supplied to the horn or like device is interrupted at a prescribed beep frequency by means of the control on the SCR (silicon controlled rectifier) device in response to the output of a flip-flop arrangement. However, the circuit of the above noted patent is adapted to be used with a DC power supply. As a result of the fact that the supply to the horn or other audible signal indicating device is direct current, the horn must be provided with an interrupter contact. Otherwise, the primary horn tone would not be produced; moreover, without such interrupter contact the SCR control device would be continuously conductive once its gate electrode had been properly triggered.

However, as a consequence of the provision for the aforesaid interrupter contact, undesirable transient negative voltages are produced. It therefore becomes necessary to provide transient protection for both the horn, or other actuator device, and also for the SCR device. Accordingly, in Patent 3,514,622, suitable diodes are connected across the horn and the SCR device for the above stated purposes.

It is therefore a primary object of the present invention to overcome the drawbacks thus present in the prior art and to provide a simplified, intermittently operated, device that can function efficiently upon connection to a conventional AC power supply, thereby avoiding the need for protection devices.

Another object is to provide a simple, economic and versatile structure for a pulsing alarm device that can be sold as a unit to the customer without requiring the addition of flasher circuits and the like.

Another object is to simplify the actuator circuit for the pulsing alarm device by providing that the driver stage of the actuator circuit comprises only a single transistor.

In fulfillment of the above recited objects, the present invention provides in essence a unitary, intermittently operated, alarm indicating device, such as a bell, horn or similar device, which features a built-in control system or actuator circuit uniquely connected to an AC power supply for achieving the desired intermittent operation.

More specifically the control system includes a (1) triggering circuit, which operates to trigger the gate of (2) a control device, preferably in the form of a silicon controlled rectifier; and (3) a bridge rectifier circuit,

which is specifically utilized in the instance where full wave rectification is desired. Moreover, in this instance the silicon controlled rectifier device is connected across two opposite corners of the bridge, the AC power supply being connected to the other two opposite corners.

The coil movement of the bell or other actuator device is series-connected with the AC power supply, the SCR control device also being connected in series with the coil movement. Accordingly, the coil movement produced by the AC power supply, which results in the primary belltone, is interrupted precisely in accordance with the triggering signal supplied to the control device so as to produce a "beep" or intermittent effect.

Further objects, features and advantages of the present invention will be apparent from the description which follows in the specification, taken in conjunction with the drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a schematic diagram of the actuator circuit for the system of the present invention.

FIG. **2** is a view of the bell or actuator device of the present invention and illustrating the incorporation of the actuator circuit within the bell structure.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring now to the drawing, the pulsing bell **10** of the present invention is provided with a coil **10A** and a conventional gong which sounds at a predetermined primary frequency when the AC voltage, typically 120 volt, 60 Hz, as schematically indicated in FIG. **1**, is applied to the bell. The bell **10** is unitarily constructed; that is to say, an actuator circuit **20** is enclosed within the housing **10B** of the bell. Consequently, the user need only connect the leads **12** and **14** of the unit to a suitable source such as the 120 volt AC supply normally found in most facilities for the desired intermittent operation. The actuator circuit **20** is mounted on a printed circuit board and is selectively connected to the coil movement of the bell **10** by a manually operable switch if desired, such switch not being shown. The actuator circuit **20** is connected by means of leads **12** and **14** to the 120 volt AC supply and this circuit includes a control device **22**, preferably in the form of a silicon controlled rectifier device, which is series-connected with the coil movement of the bell **10** and with the power supply.

The control device **22** is part of a bridge rectifier circuit **24** and is shown connected to the upper and lower corners of the bridge. The circuit **24** is operable in conventional fashion to provide for current flow on successive half cycles of the AC power supply. Thus on the positive half wave, the diodes **30** and **32** in opposite legs of the bridge will be conductive so as to permit current flow in the downward direction through the control device **22**. On this positive half cycle, of course, the diodes **34** and **36** in the other two opposed legs of the bridge will be non-conductive. Correspondingly, on the negative half cycle of the AC power wave, the diodes **34** and **36** will be conductive so as to enable the same direction of current flow through device **22** as was the case previously. During the negative half cycle the diodes **30** and **32** will be non-conductive.

Control of current flow through the bell **10** is effectuated by the connection of the output of a triggerig circuit **26** to the gate electrode of the control device **22**.

This control can be varied in accordance with the parameters selected for the triggering circuit. In other words, the particlar component values selected will determine the repetition rate and duty cycle for the pulse wave produced. As an example, the control on the 60 cycle tone produced by the bell **10** is ½ second on and ½ second off which results from the frequency and shape of the triggering pulses **28** supplied to the gate electrode of control device **22.**

The triggering circuit **26** is also connected to the power supply by way of a voltage divider, comprising the resistors **40** and **42,** and a diode **46.** This diode **46** operates as a rectifier to convert the AC power supply to half wave rectified DC voltage. The voltage divider operates to lower the voltage to the trigger circuit **26** so that smaller and less expensive components can be used therein. A reference line **47** for the several components in the circuit **26** is seen connected to the lower corner of the bridge rectifier **24.**

It will be noted that a further diode **48** is connected to the junction between the diode **46** and the resistor **42.** This diode functions to prevent unwanted discharge of the capacitors to be discussed; that is to say, such diode is so connected that during the negative half cycle of the power supply it operates as a high impedence so as to prevent establishment of a discharge path. It also functions, along with the capacitors **50, 52** and **54,** to produce a sufficiently stable voltage for the requisite power supply to the astable multivibrator **56,** which produces the aforesaid pulse output to the gate electrode of control device **22.**

The astable multivibrator **56** includes a pair of cross coupled transistors **58** and **60,** such transistors having their respective collectors connected to the power supply by way of resistors **62** and **64** and their respective bases connected to the power supply by the resistors **66** and **68.** The requisite cross coupling is provided by the capacitors **70** and **72** between the collector of a respective transistor and the base of the opposite transistor.

It will be noted that diodes **74** and **76** are connected in the emitter legs of the respective transistors **58** and **60.** These diodes are placed in the circuit because the capacitors **70** and **72** have been found to experience reverse voltages which are likely to exceed their normal breakdown voltages. Hence these diodes are utilized to operate as protecttive devices for the capacitors.

The driver stage of the triggering circuit **26** consists of a single transistor **80** which, as can be seen, is connected to the collector of transistor **60** by means of the diode **82.** This diode **82** functions as a compensating means for the fact that voltage level changes are brought about by the use of the diodes **74** and **76** in the multivibrator circuit.

It will be understood that the driver stage consisting of the transistor **80** is a high impedence stage, being basically an emitter follower stage. The emitter of transistor **80** is connected to a voltage divider consisting of the resistors **84** and **86,** the output being taken at the junction of these two resistors. Output is shown by the aforenoted pulse wave **28.**

It should be noted that, although exact synchronism does not obtain between the pulse output **28** and the AC power supply wave, as that power is being applied to the bell **10,** nevertheless automatic synchronism results from the fact that the termination of a given positive pulse in the wave **28** results in removing bias from the gate electrode of control device **22.** Accordingly, as the particular cycle of AC power through the coil **10A** reaches its zero crossing (in the case of full wave), the SCR device **22** at that point in time goes into its high impedence state so as to prevent further current flow through the bell **10** until the next occurrence of a positive pulse in wave **28.** Thus it will be appreciated that turn off of the SCR device **22** is always effected substantially at the moment that the AC power has reached the zero level. Hence there is no problem with transient effects.

It will be appreciated that the trigger pulse **28** as applied to the gate of SCR device **22** is a relatively long continuous pulse. As noted previously it is on the order of ½ second which is equivalent to 30 cycles for the 60 cycle power supply.

In order that the man skilled in the art may have a detailed set of specifications that were used in one practical embodiment of the present invention, the following table of components for the actuator circuit is provided:

COMPONENTS	TYPE/VALUE AND RATING
Diodes 30, 32, 34, 36, 46, 48, 74, 76, 82	IN 4004 - IA, 400 PIV
SCR 22	2N 5064 - 800 MA, 200 volt
Transistors 58, 60 & 80	2N 3417 - 360 MW, 500 MA
Capacitors 70 & 72	4.7 mf, 35 V
Capacitors 50, 52, & 54	33 uF, 10V
Resistor 40	3,900 ohms, 5W
Resistor 42	220 ohms, ¼ W
Resistors 62 & 64	10,000 ohms, ¼ W
Resistors 66 & 68	150,000 ohms, ¼ W
Resistor 86	1,000 ohms, ¼ W
Resistor 88	1,800 ohms, ¼ W

While there has been shown and described what is considered at present to be the preferred embodiment of the invention, it will be appreciated that other embodiments can be devised. For example, although a full wave bridge rectifier circuit **24** has been illustrated in FIG. **1,** a half wave rectifier circuit can similarly be employed to operate the bell **10** or other load.

Other modifications will readily occur to those skilled in the related arts. It is desired, therefore, that the invention not be limited to the embodiment shown and described, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A unitary alarm indicating device adapted to be intermittently operated from an AC power supply, comprising:

a. an actuator device including a housing therefore,

b. an actuator circuit enclosed within said actuator housing, said actuator circuit including,

1. a control device having an anode, cathode and gate,

2. an electronic triggering circuit for producing a series of square wave pulses for effectuating intermittent operation of said actuator, said triggering circuit having its output connected to the gate of said control device, and

3. a rectifier circuit connecting said AC power supply to the anode and cathode of said control device.

2. A device as defined in claim **1,** in which said control device is a silicon controlled rectifier.

3. An alarm device as defined in claim **2** in which said rectifier is a full wave bridge rectifier, said silicon con-

trolled rectifier being connected between two opposed corners of said bridge, the power supply being connected to the remaining opposed corners of said bridge.

4. An alarm device or system as defined in claim **2** in which said triggering circuit includes an astable multivibrator and a driver stage connected to the output of the multivibrator, said driver stage consisting of a single transistor; a first voltage divider connected to the output of said transistor, the gate electrode of said silicon controlled rectifier being connected to the junction of the pair of resistors defining said voltage divider.

5. A device as defined in claim **2** in which said triggering circuit has its output connected to the gate electrode of said silicon controlled rectifier device, and including a reference line for said triggering circuit connected to the cathode of said SCR device.

6. A device as defined in claim **1**, further including a second rectifier device connected to the AC power supply so as to furnish DC power to said triggering circuit.

7. A device as defined in claim **4**, further comprising a second voltage divider, a second rectifier device, and a third diode connected to the junction between a pair of resistors defining said second voltage divider.

8. A device as defined in claim **4** in which said astable multivibrator includes cross coupled transistors, the emitter circuit of each of which includes a fourth and a fifth diode, and a sixth diode connected between the output of said astable multivibrator and the driver stage for said triggering circuit.

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