

[54] **ELECTRONIC SIREN SYSTEM**

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

[58] Field of Search **340/384 R**

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[57]

ABSTRACT

A siren system in which a sound producing transducer is coupled to a basic oscillating circuit through a push-pull amplifier and a semiconductor phase inverter. The basic oscillating circuit is modulated by a relaxation oscillator. A semi-conductor device, which acts as a variable resistance, is connected in a resistance-capacitance circuit of the basic oscillating circuit and is coupled to the relaxation oscillator.

9 Claims, 2 Drawing Figures

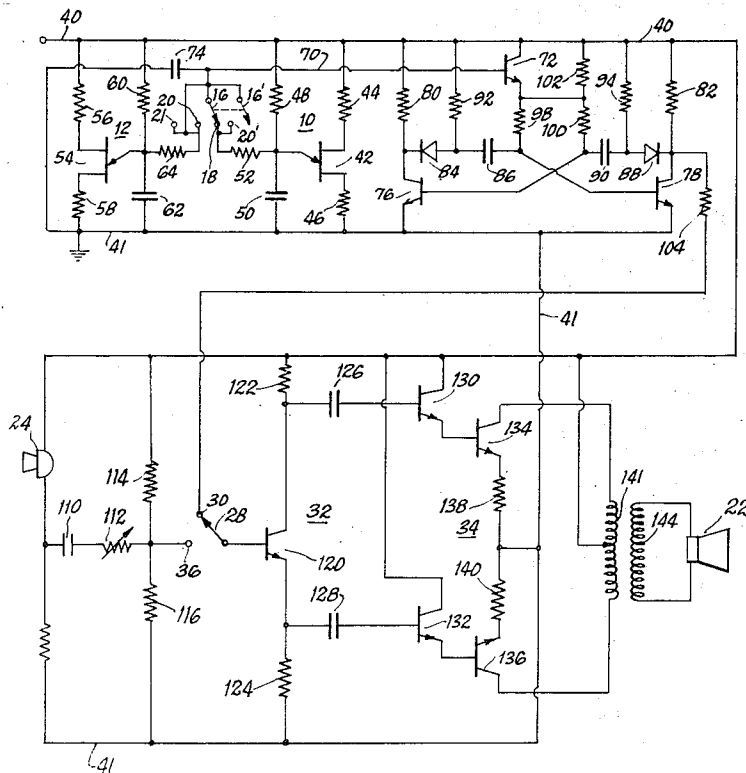


FIG. 1

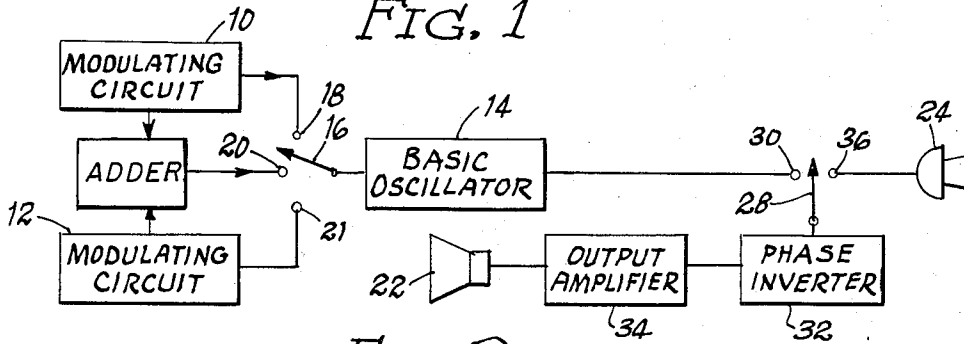
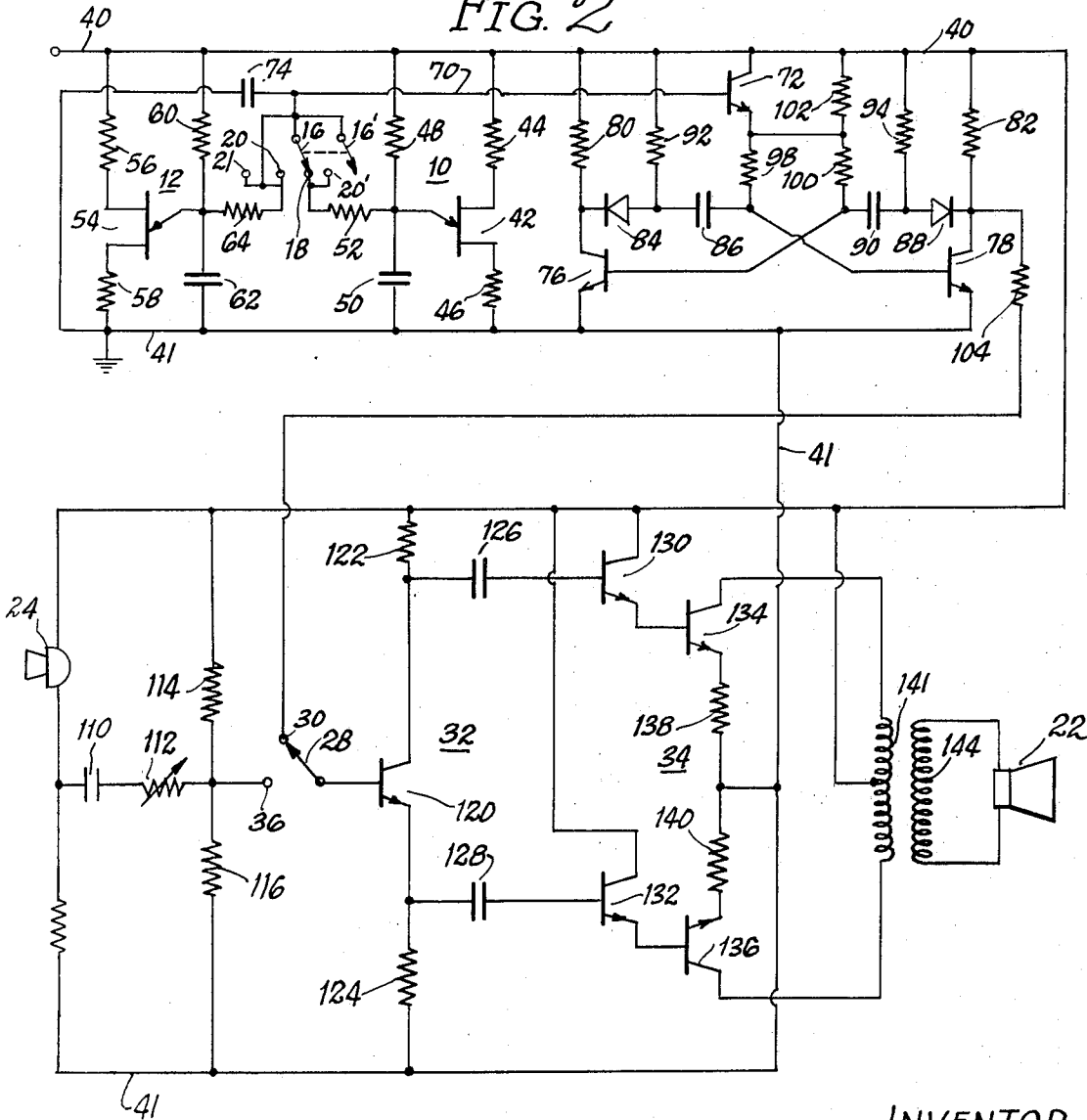


FIG. 2



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ELECTRONIC SIREN SYSTEM

This is a continuation, of Application Ser. No. 884,828, filed Dec. 15, 1969, now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to a system for operating a sound producing transducer.

Electronic circuits for operating sound producing transducers to produce siren tones are known, but some prior art electronic siren circuits have been found to be relatively expensive and unreliable. It is very important that siren devices available for police, fire and civil defense use be reliable and provide a high output in relation to the amount of power consumed.

The present invention concerns a siren system which, in its illustrative embodiment, utilizes semiconductor devices and can be constructed in a package that is smaller, lighter and less expensive than prior art siren systems.

BRIEF SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a siren system for operating a sound producing transducer, which includes a basic oscillating circuit having an output responsive to the time constant of a resistance-capacitance circuit. Means are provided for connecting the oscillating circuit to a direct current source.

A relaxation oscillator is provided for modulating the basic oscillating circuit output. The relaxation oscillator and the basic oscillating circuit are coupled by a semiconductor device which is connected in a resistance-capacitance circuit of the basic oscillating circuit. In this manner, the resistance of the resistance-capacitance circuit is varied in response to modulating signals from the output of the relaxation oscillator.

In the illustrative embodiment, the semiconductor device in the resistance-capacitance circuit comprises a transistor having its emitter-collector circuit in series with the resistance-capacitance circuit and having its base connected to the output of the relaxation oscillator.

In the illustrative embodiment, the siren system further includes a push-pull amplifier connected to the sound producing transducer. A semiconductor phase inverter couples the basic oscillating circuit output to the push-pull amplifier.

The push-pull amplifier of the illustrative embodiment includes a first transistor and a second transistor, and the phase inverter includes a transistor having its collector coupled to the base of the first transistor and its emitter coupled to the base of the second transistor. The base of the phase inverter transistor is coupled to the output of the basic oscillating circuit.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

A more detailed explanation of the invention is provided in the following description and claims, and is illustrated in the accompanying drawing, in which:

FIG. 1 is a schematic block diagram of an electronic siren system in accordance with the present invention; and

FIG. 2 is a schematic circuit diagram of the circuit of FIG. 1.

DETAILED DESCRIPTION OF THE ILLUSTRATIVE EMBODIMENT

In FIG. 1 there is shown a pair of modulating circuits 10 and 12 which are selectively connected to a basic oscillating circuit 14 by movement of switch arm 16. Engagement of arm 16 with contact 18 will connect modulating circuit 10 to basic oscillating circuit 14, engagement of arm 16 with contact 20 will connect the added outputs of modulating circuits 10 and 12 to basic oscillating circuit 14, and engagement of arm 16 with contact 21 will connect modulating circuit 12 to basic oscillating circuit 14.

A sound producing transducer or speaker 22 is selectively energized by a signal from either oscillating circuit 14 or microphone 24. If a siren output is desired, the operator will place switch arm 28 in engagement with contact 30. The operator can then select the siren tone by moving switch arm 16 to engage one of the contacts 18, 20, 21. For example, if contact 18 is selected, basic oscillator 14 will be modulated by modulating circuit 10 to provide a signal which is fed to phase inverter 32, amplified by amplifier 34 and fed to speaker 22 which produces the siren tone.

If the operator wishes to use a loudspeaker system, the switch arm 28 is moved to engage contact 36, thereby coupling microphone 24 through phase inverter 32 and output amplifier 34 to speaker 22.

An example of circuit elements which may be utilized to form the system illustrated in FIG. 1 is shown in FIG. 2.

The first modulating circuit 10 is connected across input line 40,41 which are connected to a direct current supply. Modulating circuit 10 comprises a unijunction transistor 42 having resistor 44 connecting one base to line 40 and resistor 46 connecting the other base to line 41. The emitter of the unijunction transistor is connected to line 40 through resistor 48 and is connected to line 41 through capacitor 50. The emitter of the unijunction transistor is also connected to switch contact 18,20' through a resistor 52.

In the illustrative embodiment, modulating circuit 12 is similar to modulating circuit 10 in that it also includes a unijunction transistor 54 which is connected to line 40 through resistor 56 and to line 41 through resistor 58. The emitter is connected through resistor 60 to line 40 and through capacitor 62 to line 41. A resistor 64 couples the emitter of the unijunction transistor 54 to switch contacts 20,21.

Resistor 48 and capacitor 50 of modulating circuit 10 have different values than resistor 60 and capacitor 62 of modulator 12. In this manner, the time constant of the resistance-capacitance circuit of modulator 10 is different from the time constant of the resistance-capacitance circuit of modulator 12. When one of the ganged switch arms 16,16' is in engagement with contact 18 (as shown in FIG. 2) the output of modulator 10 will be fed via line 70 to the base of semiconductor device 72, which in the illustrative embodiment, is a transistor. When switch arms 16,16' are in engagement with contacts 20,20', respectively, the output of modulators 10 and 12 will be added and fed via line 70 to the base of transistor 72. When one of the ganged switch arms 16,16' is in engagement with contact 21, the output of modulator 12 will be fed via line 70 to the base of transistor 72.

Modulators 10 and 12 are relaxation oscillators which produce sawtooth wave forms at the emitters of the respective unijunction transistors. The time duration of each cycle of the sawtooth is determined by the time constant of the resistance-capacitance circuits of the respective modulating circuits. Since the output from the emitter of unijunction transistor 42 is taken through resistor 52, and the output from the emitter of unijunction transistor 54 is taken through the resistor 64, when the resistors 52 and 64 are connected by engaging switch arms 16,16' with contacts 20,20', the voltage wave forms on the emitters will be added at the junction of resistors 52,64 if all of the terminals are isolated from input line 41. A capacitor 74 is provided to retard the voltage drop from the peak to the valley of the sawtooth wave forms.

The basic oscillator 14 includes a first transistor 76 and a second transistor 78, both of which have their emitters directly connected to line 41. The emitter-collector circuit of transistor 76 is connected in series with resistor 80 across lines 40 and 41 and the emitter-collector circuit of transistor 78 is connected in series with resistor 82 across lines 40 and 41. The collector of transistor 76 is coupled to the base of transistor 78 by a blocking diode 84 and a capacitor 86 and the collector of transistor 78 is coupled to the base of transistor 76 by a blocking diode 88 and a capacitor 90. The junction between blocking diode 84 and capacitor 86 is connected to line 40 through a resistor 92 and the junction between blocking diode 88 and capacitor 90 is connected to line 40 through a resistor 94.

The collector of transistor 72 is connected to line 40 and the emitter of transistor 72 is coupled to the base of transistor 78 through resistor 98 and to the base of transistor 76 through resistor 100. A resistor 102 is connected between the emitter of transistor 72 and line 40 and also between resistor 100 and line 40.

Oscillator 14 is an astable multivibrator having a square wave output. Diodes 84 and 88 improve the linearity of the square wave output by blocking capacitor discharge through the collector resistors of the transistors. The transistor 72 serves as a variable resistance, with its variability being dependent upon the base current that it receives from the unijunction modulating circuits. Hence the transistor 72 serves to modulate the output of the multivibrator by varying its resistance-capacitance time constant.

The illustrated circuit provides a multivibrator which has a substantially linear frequency dependency upon the modulating voltage. The oscillator frequency range can be increased by lowering the value of resistors 98 and 100.

The output of oscillator 14 is DC coupled through resistor 104 to the input of phase inverter 32. A selector switch arm 28 is provided between phase inverter 32 and the output of oscillator 14, so that the operator can select the siren mode or a loudspeaker mode. As stated above, when arm 28 engages contact 30, the siren circuit is operative and when arm 28 engages contact 36, the loudspeaker circuit is operative.

The loudspeaker circuit includes a microphone 24 connected in series with resistor 108 across lines 40 and 41. The microphone is connected to the contact 36 through a capacitor 110 and a potentiometer 112. A resistor 114 is connected to line 40 and to the junction 115 of potentiometer 112 and contact 36, and a resistor

116 is connected between the junction 115 and line 41.

Phase inverter 32 comprises a transistor 120 having its collector connected to line 40 through a resistor 122 and its emitter connected to line 41 through a resistor 124. The signals at the emitter and collector of transistor 120 and 180° out of phase, and the values of resistors 122 and 124 are designed to give these signals equal amplitude.

Output amplifier 34 comprises a push-pull amplifier which is coupled to phase inverter transistor 120 through collector capacitor 126 and emitter capacitor 128. Capacitor 126 is connected to the base of a transistor 130 the collector of which is connected to line 40 and capacitor 128 is connected to the base of transistor 132, the collector of which is connected to line 40. The emitters of transistors 130 and 132 are respectively connected to the bases of transistors 134 and 136. The emitters of transistors 134 and 136 are coupled to line 41 through resistors 138 and 140, respectively, and the collectors of transistors 134 and 136 are connected to opposite sides of a common transformer 141 which is center-tapped and coupled via line 142 to line 40. The transformer secondary 144 is connected across speaker 22.

Resistors 138 and 140 are used for temperature stability.

Although no limitation is intended, the following values were utilized in a specific example of the invention which was found to operate satisfactorily.

Element	Value or Model No.
Unijunction transistor 42	TIS43
Resistor 44	560 ohms
Resistor 46	56 ohms
Resistor 48	560K
Capacitor 50	4 mfd
Resistor 52	1 meg
Unijunction transistor 54	TIS43
Resistor 56	560 ohms
Resistor 58	56 ohms
Resistor 60	150K
Capacitor 62	2 mfd
Resistor 64	1 meg
Transistor 72	2N3904
Capacitor 74	0.068 mfd
Transistor 76	2N3904
Transistor 78	2N3904
Resistor 80	4.7K
Resistor 82	1.8K
Diode 84	FD100
Capacitor 86	0.04 mfd
Diode 88	FD100
Capacitor 90	0.04 mfd
Resistor 92	4.7K
Resistor 94	4.7K
Resistor 98	12K
Resistor 100	12K
Resistor 102	22K
Resistor 104	1.5K
Resistor 108	47 ohms
Capacitor 110	0.15 mfd
Potentiometer 112	0-10K
Resistor 114	5.6K
Resistor 116	2.2K
Transistor 120	2N3053
Resistor 122	100 ohms
Resistor 124	100 ohms
Capacitor 126	0.5 mfd
Capacitor 128	0.5 mfd
Transistor 130	2N3053
Transistor 132	2N3053
Transistor 134	2N3055
Transistor 136	2N3055
Resistor 138	½ ohm
Resistor 140	½ ohm

A siren circuit has been provided that is relatively inexpensive to produce, can be housed in a relatively small and light housing, and has high gain with respect to power consumed. The components are such as to in-

sure reliable operation. Although an illustrative embodiment of the invention has been shown and described, it is to be understood that various modifications and substitutions can be made by those skilled in the art without departing from the novel spirit and scope of the present invention.

I claim:

1. An electronic siren system for operating a sound producing transducer, which comprises: a direct current constant voltage source; a basic oscillating circuit including a resistance-capacitance circuit, said basic oscillating circuit being connected across said direct current constant voltage source and generating an output having a frequency determined as a function of the time constant of said resistance-capacitance circuit and the value of the voltage applied to said basic oscillating circuit; means for varying the frequency of the output of said basic oscillating circuit including a modulating oscillator connected across said direct current constant voltage source for generating a varying modulating voltage output, and means for applying said varying modulating voltage to said basic oscillating circuit for varying the frequency of the output of said basic oscillating circuit as a function of the variation in the modulating voltage; said modulating voltage applying means including a semiconductor device connected between said direct current constant voltage source and said basic oscillating circuit, and means coupling said semiconductor device to said modulating oscillator for applying said varying modulating voltage to said semiconductor device, said semiconductor device varying the voltage applied to said basic oscillator circuit in response to and as a function of the variation in said modulating voltage to effect variation in the frequency of the output of said basic oscillating circuit.

2. An electronic siren system as described in claim 1, in which said semiconductor device comprises a transistor, means connecting the emitter-collector circuit of said transistor between said direct current constant voltage source and said basic oscillating circuit, and said coupling means connecting the base of said transistor to the output of said modulating oscillator.

3. An electronic siren system as described in claim 2, in which said modulating oscillator includes a relaxation oscillator comprised of a unijunction transistor and a resistance-capacitance circuit connected to a base-emitter circuit of said unijunction transistor to produce said modulating voltage in the form of a sawtooth output at the emitter of said unijunction transistor; and wherein said coupling means connects the base of said transistor to the emitter of said unijunction transistor.

4. An electronic siren system as claimed in claim 2, in which said modulating oscillator includes two relaxation oscillators each comprised of a unijunction transistor and a resistance-capacitance circuit connected to the base-emitter circuit of said unijunction transistor to produce said modulating voltage in the form of a sawtooth wave output at the emitter of said unijunction transistor; wherein the frequency of the modulating voltage output of one of said relaxation oscillators is different than the frequency of the modulating voltage of the other of said relaxation oscillators; and wherein said coupling means includes switching means for selectively connecting either or both of said relaxation oscillators to the base of said transistor.

5. An electronic siren system as described in claim 1, and further including a push-pull amplifier adapted to apply the output of said basic oscillator circuit to the sound producing transducer; and a semiconductor phase inverter coupling said basic oscillating circuit output to said push-pull amplifier.

6. An electronic siren system as described in claim 5, wherein said push-pull amplifier includes a first transistor and a second transistor, and said phase inverter includes a transistor, means coupling the collector of said phase inverter transistor to the base of said first transistor and means for coupling the emitter of said phase inverter transistor to the base of said second transistor, whereby the signal at the base of said first transistor is 180° out of phase with the signal at the base of said second transistor, and means coupling the base of said phase inverter transistor to the output of said basic oscillating circuit.

7. An electronic siren system as described in claim 6, including first and second output transistors having their collectors connected across a common output transformer and their emitters coupled to a common point, means for coupling the emitter of said first transistor to the base of said first output transistor and means for coupling the emitter of said second transistor to the base of said second output transistor, and means for balancing the signals at the collector and emitter of said phase inverter transistor, whereby the base signals of said first and second output transistors are equal.

8. An electronic siren system as described in claim 7, said balancing means comprising a resistance connected to the emitter of said phase inverter transistor and a resistance connected to the collector of said phase inverter transistor.

9. An electronic siren system comprising: a direct current constant voltage source; a multivibrator including a pair of transistors and a resistance-capacitance circuit, said multivibrator being connected across said direct current constant voltage source and generating an output having a frequency determined as a function of the time constant of said resistance-capacitance circuit and the value of the voltage applied thereto; a pair of modulating oscillators generating varying modulating voltage outputs of different frequencies; means for selectively connecting said modulating voltages from either or both of said modulating oscillators to said multivibrator to vary the frequency of the output thereof as a function of the variation of the applied voltage including: a transistor having its emitter-collector circuit connected in series between said direct current constant voltage source and said multivibrator and, switching means for selectively connecting the base of said transistor to either or both of said modulating oscillators, said transistor varying the voltage applied to said multivibrator in response to and as a function of the variation in the modulating voltage applied to its base to effect a variation in the frequency of the output of said multivibrator; a transistor phase inverter circuit, means coupling the base of said phase inverter transistor to the output of said multivibrator; a push-pull transistor amplifier including first and second transistors, means connecting the base of said first transistor to the collector of said phase inverter transistor and means connecting base of said second transistor to the emitter of said phase inverter transistor, whereby the signal at the base of the first transistor is 180° out of phase with the signal at the base of the second transistor; a sound producing transducer, and means connecting said sound producing transducer to the output of said push-pull amplifier.

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