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Herbits

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[54] **AUTOMATIC DIMMING AND RECYCLEABLE LAMP**

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[51] **Int. Cl.** **H03k 17/56;** H04r 3/00

[58] **Field of Search** ..... 179/1 VC, 1 VL; 340/148, 340/279; 181/.5 SH; 200/61.01, 33 R; 315/291, 307

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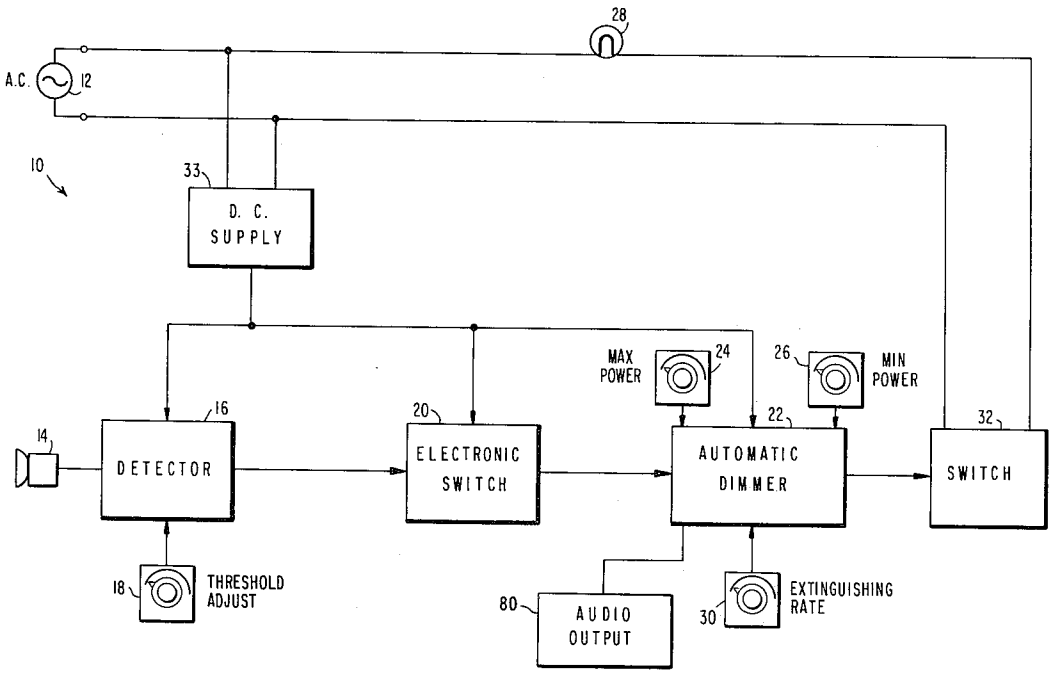
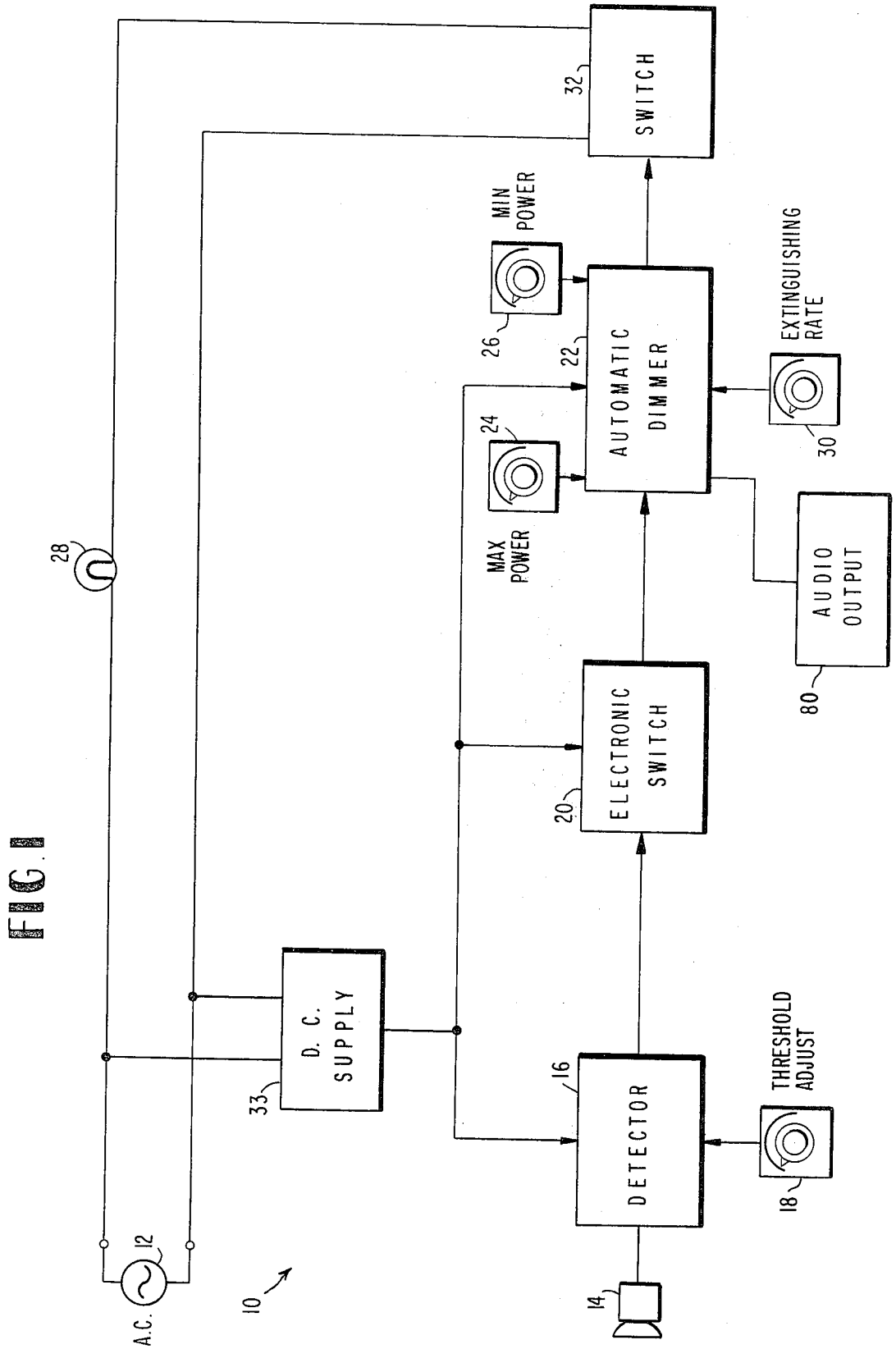
[57] **ABSTRACT**

A sound responsive apparatus for automatically dimming a lamp from an initial condition of maximum brightness to a terminal condition of minimum brightness comprising a detector for detecting the presence of sound having at least a predetermined amplitude and an automatic dimming apparatus operatively connected to the detector to actuate the automatic dimming apparatus upon detecting sound having at least the predetermined amplitude. The automatic dimming apparatus, when actuated, controls the brightness of the lamp from a first level of brightness to a second, diminished, level of brightness. Means may be provided for varying the period of time required for the lamp to pass from maximum brightness to minimum brightness.

14 Claims, 2 Drawing Figures




A.C.
12
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DETECTOR
16
THRESHOLD ADJUST
18
D. C. SUPPLY
33
ELECTRONIC SWITCH
20
AUTOMATIC DIMMER
22
MIN POWER
26
MAX POWER
24
EXTINGUISHING RATE
30
AUDIO OUTPUT
80
SWITCH
32
28

FIG. 1

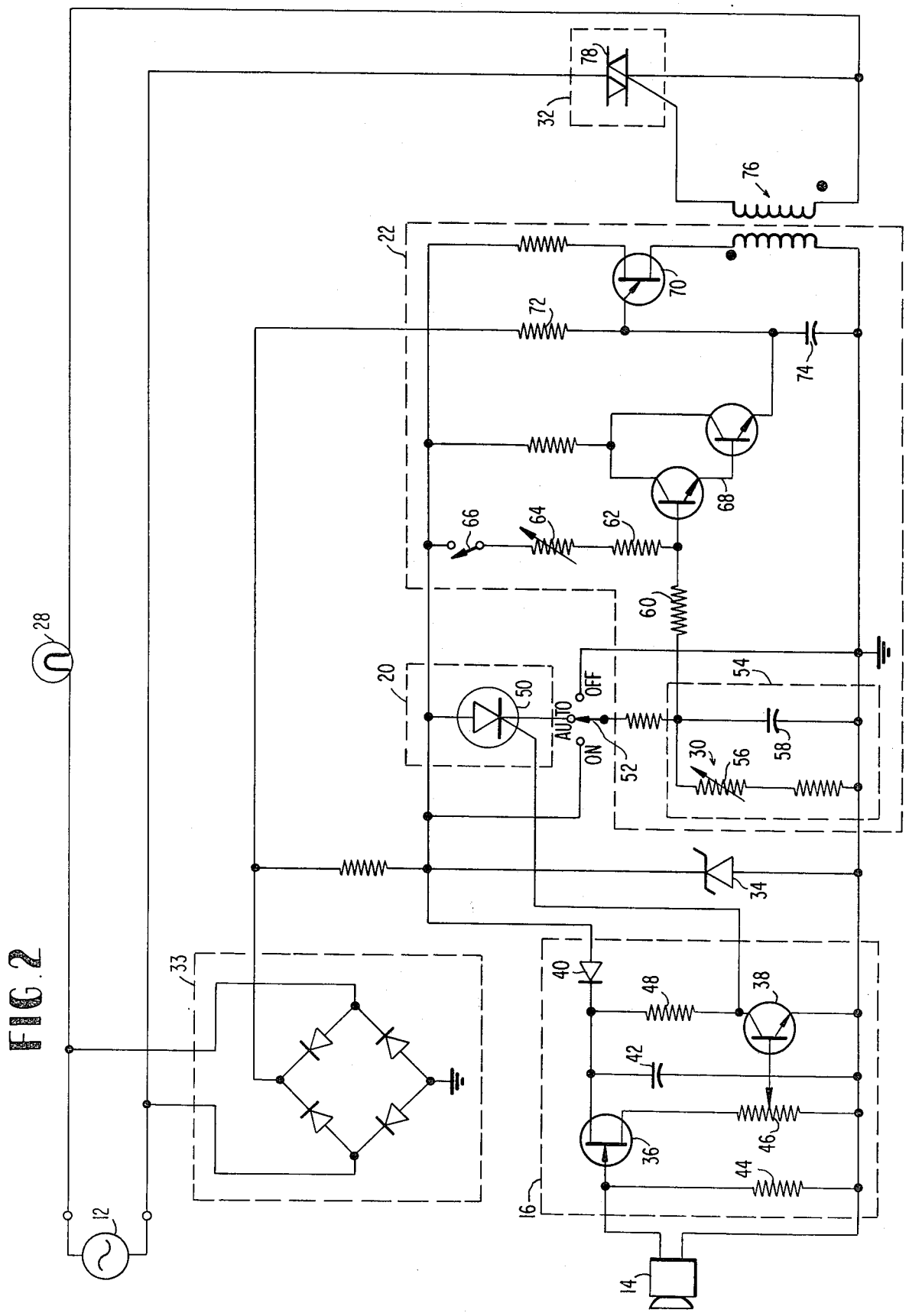
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FIG. 2

AUTOMATIC DIMMING AND RECYCLEABLE LAMP

BACKGROUND OF THE INVENTION

The present invention relates to a control apparatus for varying the power available to a load in response to the presence of sound having at least a predetermined amplitude. More particularly, the invention relates to an electric lamp which is illuminated in response to the presence of sound above a preselected level and is then automatically dimmed.

It is a common problem with children, especially during very early years, to require some kind of attention during the night. Since many children are afraid of the dark, some form of continuously-on night light may be required to provide sufficient reassurance and to eliminate what otherwise might be discipline problems.

It is well known that many persons, including children, enjoy sounder sleep in total darkness. Hence, many parents wait until their children fall asleep with some form of night light burning and quietly enter the room to turn off the light. This may often prove to be a source of great annoyance and inconvenience to the parents.

If such a child awakens during the night, he may cry if he discovers he is in darkness, and he may require that the night light be turned on again before he will stop crying. Such sleeping habits may prove not only annoying to the parents of such children but also may damage the physical and mental health of the parents.

It has been found that a gradually dimming light will tend to relax and make a person in the presence of such light sleepy. It has also been found that the sleep inducing effect of the gradually dimming light is particularly effective with children.

In addition and of independent significance are time-delay switches which are operable to provide a delay of a predetermined time period before the switching action is completed. Such devices permit, for example, a person to operate a light switch, cross a room, and get into bed before the light is switched off. However, to turn on the light again, the person may be required to walk across the dark room to reactivate the switch with a risk of stumbling or falling in the dark room.

Devices exist in the prior art which activate lights in response to sound. Such devices provide increased power to a lamp in response to relatively loud sounds and reduced power to the lamp in response to relatively quiet sounds so that the light flickers in response to the varying amplitude of the sound.

Other devices exist which activate a switch in response to the presence of sound above a preselected threshold volume. Devices also exist in the prior art for dimming a light from a first level of intensity to a second level of intensity.

However, the need continues to exist for a device which is suitable to automatically activate a lamp to, say, provide assurance to children awakening in the night and thereafter provide a sleep inducing dimming of the lamp over a preselected period of time in response to the child's needs as evidenced by crying and the like.

It would therefore be desirable to provide an automatic, light dimming apparatus which can be activated by sound above a predetermined amplitude and which may be reset upon each subsequent reoccurrence of this preselected sound amplitude.

OBJECTS AND SUMMARY OF A PREFERRED EMBODIMENT OF THE PRESENT INVENTION

It is, therefore, a general object of the present invention to provide an automatic light dimming apparatus which minimizes or reduces the problems and shortcomings of the type previously noted.

It is a more particular object of the present invention to provide a slowly extinguishing light which may be sound actuated and which may be subsequently reset by sound.

It is another object of the present invention to provide an automatic resetting light dimming apparatus which may slowly extinguish a light from a first predetermined brillance to a second predetermined brillance and maintain the light at the second predetermined brillance.

It is yet a further object of the present invention to provide an automatic, resetting light dimming apparatus which has a preselected extinguishing rate.

It is yet a further object of the present invention to provide an automatic, resetting light dimming apparatus which may be reset either during a dimming cycle or after a dimming cycle has completed.

An automatic, resetting light dimming apparatus according to a preferred embodiment of the present invention intended to substantially accomplish the foregoing objects includes a lamp, a detector for detecting the presence of sound having a predetermined amplitude, a dimmer for automatically controlling the brightness of the lamp, when actuated, from a first level of brightness to a second, diminished level of brightness over a predetermined time period, means for providing power to the lamp, and a switch which is responsive to the sound detector for actuating the dimmer in the presence of a predetermined amplitude of sound. The apparatus may include means for varying the extinguishing rate of the lamp and may further include means for setting the initial and terminal intensities of the lamp. Moreover, means may be provided for varying the minimum amplitude or threshold sound at which the apparatus is actuated.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of the present invention will become apparent with reference to the following detailed description of a preferred embodiment thereof in connection with the accompanying drawings wherein like reference numerals have been applied to like elements, in which:

FIG. **1** is a block diagram of the apparatus of the present invention; and

FIG. **2** is a schematic diagram of a preferred embodiment of the present invention.

In FIG. **1** there may be seen an automatic resetting dimming apparatus **10** connected to a source **12** of alternating current. A microphone **14** is provided which is connected to a detector stage **16.** The microphone **14** may be a conventional crystal microphone. The detector stage **16** is operable to detect an audio signal having a predetermined amplitude. The minimum amplitude to which the detector will be responsive may be preset by means of a threshold adjustment **18.**

The detector **16** is connected to an electronic switch **20** which is actuated when the detector receives an audio signal above the preset threshold amplitude. This electronic switch **20** is connected to an automatic dim-

mer 22 and is operable to reset the automatic dimmer.

This automatic dimmer 22 may include a maximum adjustment 24 and a minimum adjustment 26. The maximum adjustment is generally preset to at least provide the maximum illumination from the lamp 28 although, if desired, the maximum adjustment may be adjusted to a lesser value. The minimum adjustment 26 is operable to set the minimum illumination at which the light 28 may be continuously maintained when the automatic dimmer 22 has cycled through its extinguishing period. Often, the minimum adjustment may be set at a value which gives substantially zero illumination. In the preferred form of the invention, the automatic dimmer 22 is electronic and when triggered, will alternately charge and discharge an RC circuit having an extremely long time constant as will be described in greater detail below. In the alternative, the automatic dimmer 22 may include a conventional clock or similar timing mechanism (not shown) connected to a rheostat (also not shown).

The automatic dimmer 22 may include an adjustment 30 for adjusting the extinguishing rate which will determine the period required for the dimmer to pass from its initial maximum setting to its terminal minimum setting.

The automatic dimmer 22 is connected to a switch 32. This switch 32 controls the average power from the alternating current source 12 which is applied to the light 28. In the preferred form of the invention, this switch may be a solid state electronic circuit which conducts current for a relatively long interval when the automatic dimmer is operating in the maximum range of its cycle and for a relatively short interval when the automatic dimmer is operating in the minimum range of its cycle.

Thus, it can be seen that sound will be converted to an audio signal in the detector. If the audio signal is of a sufficient amplitude to exceed the threshold adjustment, the first switch 20 will be actuated. When the switch 20 is actuated, it triggers the automatic dimmer 22. The automatic dimmer in turn is connected to a second switch 32 and the automatic dimmer and switch 32 together function to provide a predetermined maximum power to the light and then reduce the power to a predetermined minimum to thereby reduce or dim the illumination provided by the light 28. The automatic dimmer may be adjusted to vary the rate at which the maximum power falls to the minimum power. This period or extinguishing rate, may vary from several seconds to, a predetermined time of up to about 20 minutes.

The sound responsive apparatus of the present invention may also optionally include an audio output device 80 shown by dotted lines in FIG. 1 such as a tape player, cassette player, radio, television or the like. The audio output device may be operative in conjunction with the sound responsive apparatus of the invention in any suitable conventional manner so that the device is energized when the lamp circuit is actuated to the maximum brightness and is deenergized at the end of the extinguishing period. For example, the timing signal from the automatic dimmer 22 which controls the operation of the lamp 28 may control the on/off cycle of the audio output device in a suitable manner. Advantageously, the audio output device such as a tape or cassette player can be pre-programmed to include soothing, sleep-inducing lullabies or sounds of barking dogs or the like depending upon the contemplated use of the sound responsive apparatus.

In FIG. 2 there is illustrated a preferred embodiment of the invention in detailed schematic diagram form. Referring now to FIG. 2, an AC signal from the AC supply 12 may be applied to a direct current (DC) power supply source 33 to provide the DC output voltage required for the operation of the detector 16, electronic switch 20 and the automatic dimmer 22. The DC suppply 33 may be any suitable conventional AC/DC convertor such as the illustrated full wave rectifier and may include a Zenner diode 34 or other suitable voltage regulating means.

The detector 16 preferably includes a high impedance, low power input transistor 36 driven by the sound detector or microphone 14, and a further amplifying transistor 38. The transistors 36 and 38 may be applied from the DC power supply 33 through a suitably poled blocking diode 40, and the detector 16 may be coupled from the DC source through the use of a suitable decoupling capacitor 42. A biasing resistor 44 may be provided between a gate electrode of the transistor 36 and common or ground for the circuit, and load resistors 46 and 48 may be provided to develop the output signals from the transistors 36 and 38. To provide an adjustment of the threshold at which the detector is energized, the load resistor 46 may be a potentiometer so that a selectable percentage of the output signal from the transistor 36 may be coupled through the transistor 38.

The electronic switch 20 preferably comprises a silicone controlled rectifier (SCR) 50 having its anode electrode connected to the source 33 of DC voltage and having its cathode electrode connected through a control switch 52 and a variable RC timing circuit 54 to common. The output signal from the detector 16, i.e., the output from the transistor 38, may be applied to the gate electrode of the SCR 50 to control the conduction thereof.

The switch 52 may be a manually operable, three position switch having an on position, an auto and an off position. In the auto position, the charging of the RC timing circuit 54 may be controlled through selective control of the conduction of the SCR 52. In the on position of the switch 52, the RC timing circuit is kept fully charged from the DC source, and in the off position of the switch 52 the RC circuit 54 is fully discharged, i.e., is grounded.

The RC timing circuit 54 may be a part of the automatic dimmer 22 and the time constant thereof may control the period of time over which the lamp 28 is dimmed from its maximum level to its minimum level. To facilitate the adjustment of this period of time or "extinguishing rate," a variable resistor 56 may be provided to control the discharge time of a capacitor 58 and to thereby control the RC time constant of the timing circuit 54.

An output signal may be coupled from the timing circuit 54 through biasing resistors 60 and 62, through a variable biasing resistor 64, and through a switch 66 to the DC power supply output signal. The timing circuit 54 output signal may be coupled from the resistor 60-resistor 62 junction to the input terminal of a suitable amplifier such as the illustrated Darlington amplifier 68. The output signal from the amplifier 68 may be applied to the gate electrode of a conventional unijunction transistor 70 and the gate electrode of the transis-

tor **70** may be supplied through a resistor **72** with a DC biasing voltage from the DC supply **33** and may be connected to ground through a capacitor **74.** The unijunction transistor **70,** when rendered conductive, may generate a signal across the primary of a transformer **76** and the secondary winding of the transformer **76** may be connected to the gate electrode of a suitable switch **32** such as the illustrated TRIAC **78.**

In operation, the switch **66** may be coupled to the adjustment knob of the variable resistor **64** and may be closed when the variable **64** is increased in resistance. The increase in resistance of the resistor **64** controls the minimum brightness of the lamp **28** as will hereinafter become apparent. To effect this terminal brightness adjustment, the switch **52** may be placed in the auto position to engage the RC timing circuit **54.** The variable resistor **56** may be set to a position of a relatively high extinguishing rate to bring the lamp **28** to its minimum brightness. The resistor **64** may then be adjusted to set the brightness desired after the dimmer has passed through its extinguishing cycle.

Any sound detected by the microphone **14** is converted to an electrical signal and applied to the gate electrode of the transistor **36.** If the amplitude of the detected sound exceeds the threshold set by the potentiometer **46,** the transistor **38** is triggered rendering the SCR **50** conductive. Conduction of the SCR **50** charges the capacitor **58** of the RC timing circuit **54** and, as the charge on the capacitor **58** increases, the conduction of the Darlington amplifier **68** increases so that capacitor **74** charges more rapidly.

The capacitor **74,** the resistor **72** and the unijunction transistor **70** form a pulsing circuit which periodically gates the switch **32** to supply AC power to the lamp **28.** Prior to the triggering of the SCR **50,** the period of the oscillator is sufficiently long that very little AC power is supplied to the lamp **28** and the lamp **28** is quite dim. This minimum power level is set by the variable resistor **64** since the resistor **64** controls, at least in part, a bias level supplied to the amplifier **68.** When the SCR **50** conducts and the amplifier **68** charges the capacitor **74** more rapidly, the period of the oscillator or pulser formed by the unijunction transistor **70** increases considerably and the conduction period of the switch **32** is likewise increased considerably. The AC power supply to the lamp **28** is thus increased to the predetermined maximum value.

When the SCR **50** is rendered nonconductive, the capacitor **58** discharges in accordance with a time constant determined primarily by the variable resistor **56.** As the capacitor **58** discharges, the conduction of the Darlington amplifier **68** decreases and the charge time of the capacitor **74** is thus increased. The period of the unijunction transistor controlled oscillator is thus slowly decreased resulting in the gradual dimming of the lamp **28.** When the capacitor **58** reaches its initial charge condition determined primarily by the resistor **64,** the brightness of the lamp **28** is at its minimum or dimmed position. Of course, resistor **64** may be adjusted to extinguish the lamp **28** at the minimum position.

The apparatus of this preferred form of the present invention may comprise components having the following typical values:

Component	Description	Value
14	Microphone	Crystal
34	Zenner Diode	24 Volts, 1 Watt
36	Transistor	N Channel Silicon FET
38	Transistor	NPN Silicon Low to Medium Power, Beta Approximately 100
40	Diode	1 Amper, 200 PN
42	Capacitor	50 Microfarads, 30 Volts
44	Resistor	1 Megohm
46	Variable Resistor	5 Kilohms
48	Resistor	10 Kilohms
50	SCR	4500 Miliwatts
56	Variable Resistor	5 Megohms
58	Capacitor	120 Microfarads, 30 Volts
60	Resistor	1 Megohm
62	Resistor	2 Megohms
64	Variable Resistor	5 Megohms
68	Two Transistors	Each NPN Silicon Low to Medium Power, Beta Approximately 100
70	Transistor	Silicon UJT, Approximately 300 Miliwatts
72	Resistor	1 Megohm
74	Capacitor	o.1 Microfarad, 30 Volts
76	Transformer	Pulse
78	TRIAC	

SUMMARY OF ADVANTAGES AND SCOPE OF THE INVENTION

It will be appreciated that in constructing the automatic, resetting light dimming apparatus according to the present invention, certain significant advantages are provided.

In particular, the present invention may be automatically set merely by sound above a predetermined amplitude. Once the apparatus has been set to the auto position, it is not necessary that the dimmer be manually reset for subsequent dimming cycles. The apparatus may be reset at any time during the cycle by the presence of sound above the preset threshold. The extinguishing rate may be varied depending upon the particular use to which the present apparatus is put.

The present invention is operable to automatically dim a lamp to a predetermined minimum brightness so that dim light may be provided, say, throughout the night, but the light will be switched to full brillance upon the detection of, say, a crying sound and will then gradually dim again to the earlier level of minimum brightness. Whereas there are a wide variety of applications in which the present invention may be advantageous over known devices, the apparatus of the present invention finds particular utility in child care. Child care may be facilitated through the use of the present invention to the advantage of parents. The apparatus of the present invention, furthermore, can be used to induce sleep in persons who encounter difficulty in falling asleep. The present apparatus also may advantageously be used to provide increased safety to a homeowner since the noise made by a potential burglar may actuate the apparatus and scare off the burglar. Other advantageous uses will quickly come to mind.

Thus, it is apparent that there has been provided in accordance with the invention an automatic resetting light dimming apparatus that substantially satisfies the objects and advantages set forth above. Although the present invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications, and variations will be apparent to those skilled in the art in light of the foregoing disclosure of the invention. Similarly, many of

the components may be replaced by well known substitutions, or devices not yet popularly known and even devices yet to be invented, which exhibit characteristics necessary for the operation of an apparatus in accordance with the present invention. Accordingly, it is intended that all such alternatives, modifications, and variations which fall within the spirit and scope of the invention as defined in the appended claims be embraced thereby.

What is claimed is:

1. A sound responsive apparatus for automatically controlling the brightness of a lamp, said apparatus comprising:

a lamp;

detector means for detecting the presence of sound having at least a predetermined amplitude;

dimming means for energizing said lamp at a first predetermined level of brightness, when actuated, and for automatically reducing the level of brightness of said lamp from said first level to a second predetermined level of brightness lower than the first level over a predetermined time period; and

switch means cooperable with said detector means for actuating said dimming means in response to the detection of sound above the predetermined amplitude.

2. The apparatus of claim **1** and further including:

threshold adjustment means for varying the minimum amplitude of sound at which said detector means will actuate said switch means.

3. The apparatus of claim **1** and further including:

variable adjustment means for varying a minimum brightness of said lamp to prevent said dimming means from reducing the brightness of said lamp to below a predetermined level.

4. The apparatus of claim **1** and further including:

variable dimming rate adjustment means for varying the time required for said dimming means to reduce the power available to said lamp from a maximum power level to a minimum power level.

5. The apparatus of claim **1** further including:

audio output means operatively connected to said switch means and actuated by said switch means in response to to said sound above the predetermined amplitude.

6. A sound responsive apparatus for automatically reducing the power to a load from an initial condition of maximum power to a terminal condition of minimum power, said apparatus comprising:

detector means for detecting the presence of sound having at least a predetermined amplitude; and

means responsive to said detector means for providing an initial condition of maximum power to the load and for reducing over a predetermined time period the power available to the load from said initial condition of maximum power to a terminal condition of minimum power when said detector means detects sound having the predetermined amplitude.

7. The apparatus of claim **6** and further including:

threshold adjustment means for varying the minimum amplitude of sound at which said automatic power reducing means will respond to said detector means.

8. The apparatus of claim **6** and further including:

varible power reducing rate adjustment means for varying the period of time for said automatic power reducing means to reduce the power to said load from the maximum condition to the minimum condition.

9. The apparatus of claim **6** wherein the load is a lamp.

10. A sound responsive apparatus for automatically dimming a lamp, said apparatus comprising:

detector means for detecting sound having at least a predetermined amplitude;

first electronic switch means operably responsive to said detector means when sound having an amplitude at least as great as the predetermined amplitude is detected;

second electronic switch means operable to control the average power available to the lamp;

automatic dimming means actuable by said first electronic switch means for actuating said second electronic switch means to provide a maximum power level to the lamp and to reduce the average power available to the lamp from said maximum power level to a minimum power level to thereby automatically dim the lamp over a predetermined period of time when sound having at least the predetermined amplitude is detected; and

means for supplying power to said detector means, said first and second electronic switches, and said automatic dimming means.

11. The apparatus of claim **10** and further including:

threshold adjustment means for varying minimum amplitude of sound at which said detector means will actuate said first electronic switch.

12. The apparatus of claim **10** and further including:

variable adjustment means for varying a minimum power available to the lamp to prevent said automatic dimming means from reducing the power available to the lamp to below a predetermined level.

13. The apparatus of claim **10** and further including:

variable dimming rate adjustment means for varying the period of time required for said dimming means to reduce the power available to the lamp from the maximum power level to the minimum power level.

14. The apparatus of claim **10** further including:

audio output means operatively connected to said switch means and actuated by said switch means in response to said sound above the predetermined amplitude.

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