

Feb. 14, 1967

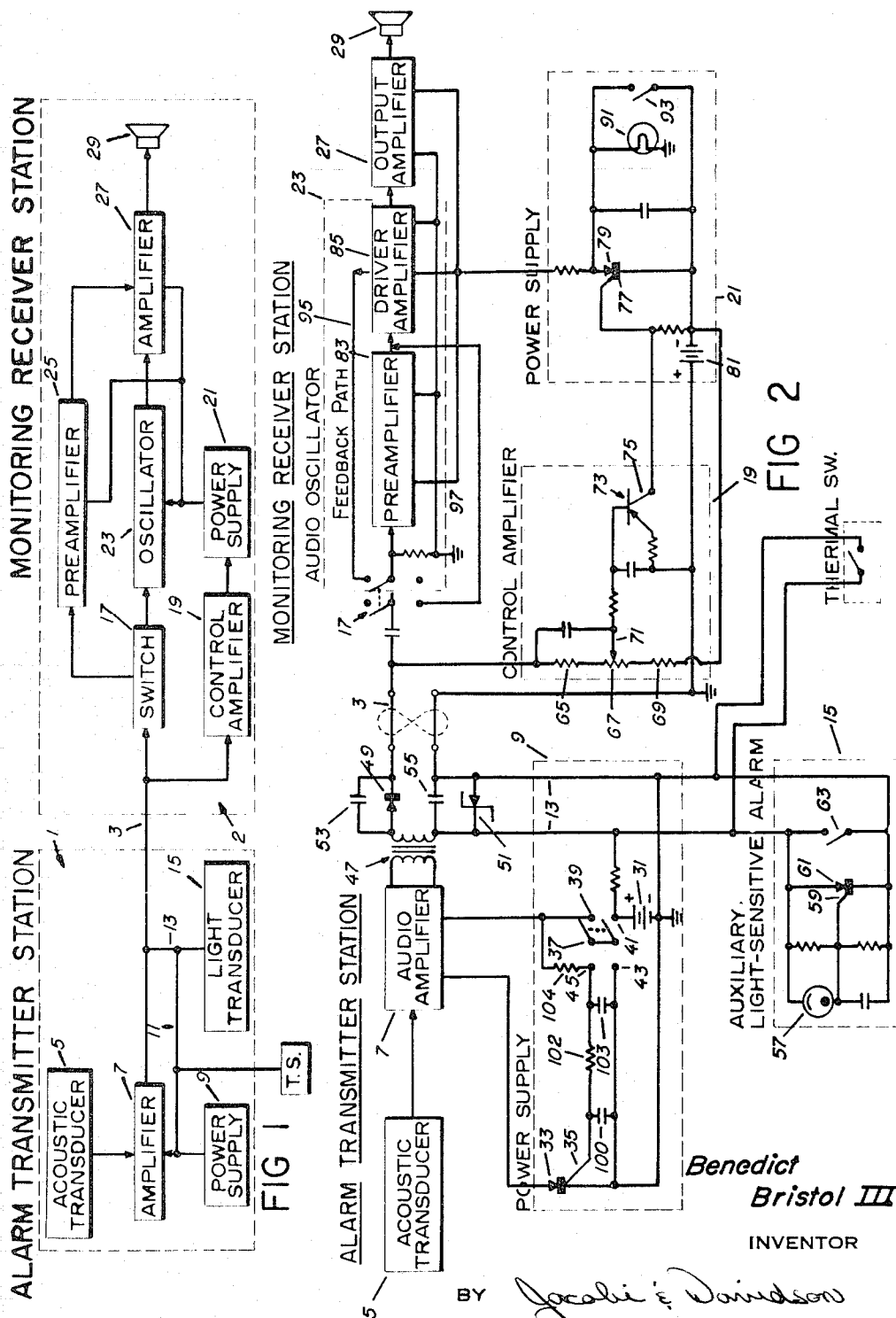
B. BRISTOL III

3,304,547

ALARM SYSTEM

Filed Dec. 30, 1964

2 Sheets-Sheet 1



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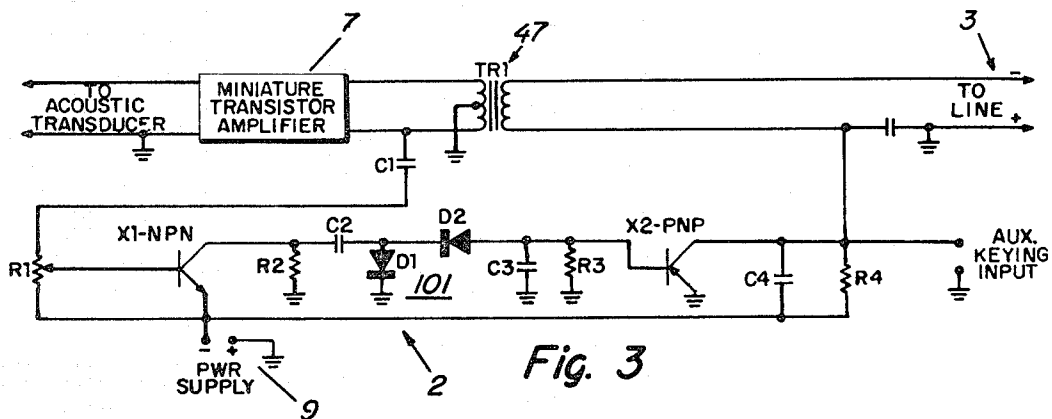
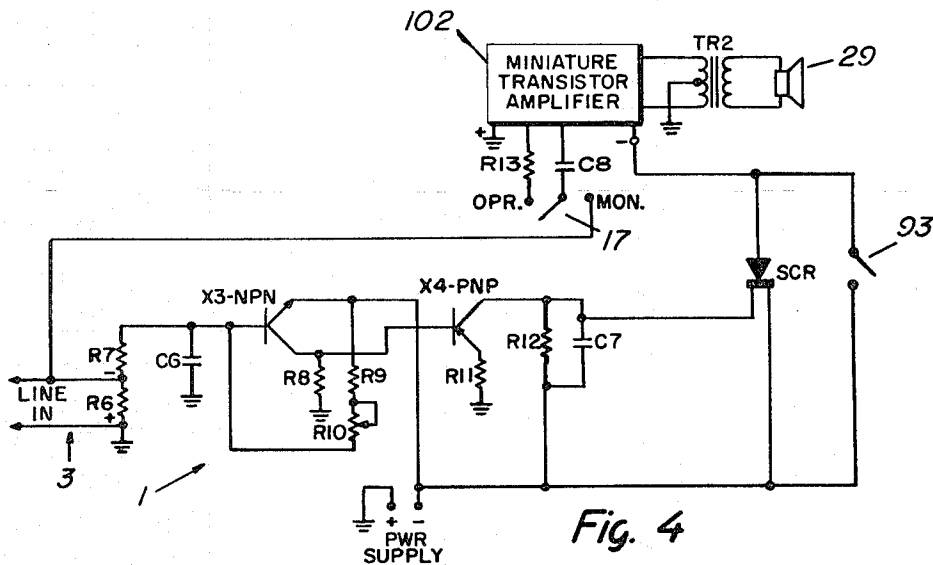
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2 Sheets-Sheet 2



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ATTORNEYS

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3,304,547
ALARM SYSTEM
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17 Claims. (Cl. 340-261)

This application is a continuation-in-part of my application Serial Number 357,534 filed April 6, 1964.

This invention relates to an alarm system, and more particularly to a burglar alarm system for monitoring unattended areas from a remote location without apprising intruders that their presence has been detected.

At the present time there are a number of different systems in use to detect the presence of intruders. None of these systems, however, is without its disadvantages. The various photocell and closed wire-loop systems cannot cover all points of possible entry, and most of these systems, as well as the familiar proximity type detection systems, fail to distinguish between accidental alarms and actual alarms, or between desirable and undesirable presences. Also, because of their complexity, the cost of prior systems has discouraged their use in many instances where they would be utilized otherwise.

There is a real need among small commercial establishments for an alarm system which is inexpensive in initial cost and maintenance-free in upkeep. In municipalities where the law enforcement staffs are limited in number it is frequently impracticable to furnish a patrolman throughout the course of the night to check the security of small businesses. Since an officer is always on duty at police headquarters, a system which requires only occasional monitoring at a central station would be ideally suited for such a situation. When an alarm is received at the central station in police headquarters, an officer can be dispatched to the area of interest to investigate and apprehend the intruder.

Accordingly, it is an object of the present invention to provide an alarm system which is inexpensive in both initial and operating costs, and which eliminates the need for constant surveillance of small business establishments by law enforcement authorities.

Another object of the invention is the provision of an alarm system having remote transmitter units for sending an alarm to a central station, thus enabling the central station to then monitor the remote station to determine the cause of the alarm.

Another object of the invention is the provision of an alarm system including a central monitoring facility with one or more remote transmitting stations in which the central facility can distinguish among alarms caused by system failure, accidental tripping and undesirable intrusion of the remote station, and outbreak of fire.

Another object of the invention is the provision of an alarm system which can be actuated and reset without warning the intruder that his presence has become known.

Another object of the invention is the provision of an alarm system having remote transmitter stations for transmitting a monitor signal to a central station and for detecting an alarm condition and modifying the monitor signal when an alarm condition is detected, and a central receiver station automatically responsive to a change in the monitor signal due to an alarm condition and manually responsive to the monitor signal to enable the central station to then monitor the remote station to determine the cause of the alarm.

Another object of the invention is the provision of an alarm system including a central receiver station monitoring facility with one or more remote transmitter stations in which the central receiver station facility can distinguish among alarms caused by system failure, accidental tripping and undesirable intrusion of the remote station,

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and outbreak of fire, and in which an alarm will not be caused by system noise.

The foregoing features and objects are realized according to the invention in a system comprising a central monitoring receiver station and one or more remote alarm transmitter stations. The alarm transmitter station includes an acoustic transducer which is energized by sound vibrations to produce an electrical signal.

In one embodiment of the invention, this signal is amplified for transmission to the central monitoring receiver station by way of a telephone transmission line. The amplifier at the alarm transmitter station is constantly energized during the operating period by a power supply which also provides a biasing function on the equipment at the central monitoring receiver station to insure fail-safe operation of the system. The system may also incorporate a light sensitive transducer at the remote alarm transmitter station to provide an additional alarm in the event that an intruder might turn on the lights or utilize a flashlight in his nefarious exploration. The light sensitive transducer can be located conveniently in the cash drawer for actuation when light is made to shine within the drawer.

The central monitoring receiver station is designed for location at headquarters of the local law enforcement agency and includes a novel oscillator-amplifier circuit arrangement which produces an audible alarm signal when the acoustic transducer at the alarm transmitter station is actuated. The equipment at the central monitoring receiver station is normally turned off, except for a control amplifier which is energized by the power supply of the remote alarm transmitter station over the interconnecting telephone transmission line. The control amplifier is biased off by this remote energization, but the bias is selected such that it will be overcome by an amplified signal generated by the acoustic transducer. When the bias is removed from the control amplifier, the control amplifier energizes a silicon controlled rectifier to apply power to the remainder of the receiver apparatus.

The oscillator-amplifier circuit is switch-controlled and normally remains in the position to actuate the oscillator upon application of the power supply. When power is applied to the oscillator, an audible alarm signal is produced to attract the attention of the operator to the system. The operator then switches to the amplifier position, which causes the electrical signals transmitted from the remote alarm transmitter station to be reproduced at the central monitoring receiver station. Since the system requires no attention until an alarm signal is received, a plurality of remote transmitter stations can be monitored by a single central monitoring receiver station.

In a second embodiment of the invention, the alarm transmitter station likewise includes an acoustic transducer which is energized by sound vibrations to produce an electrical signal. This signal is amplified for transmission to the central monitoring receiver station by way of a telephone transmission line. The amplifier at the alarm transmitter station is constantly energized during the operating period by a power supply which also provides a bias voltage to function on the equipment at the central monitoring receiver station to insure fail-safe operation of the system.

The alarm transmitter station of this embodiment, however, includes a control amplifier constantly energized during the operating period which monitors the output signal of the acoustic transducer and which is effective upon detecting an electrical output signal from the acoustic transducer to modify the bias voltage applied to the transmission line.

The system may also incorporate a light sensitive transducer at the remote alarm transmitter station to provide an additional alarm in the event that an intruder might

turn on the lights or utilize a flash-light in his nefarious exploration. Various other detectors may also be incorporated such as mechanical switches to detect opening of a door or window, or the like, or thermally responsive switches to detect a fire. Each of these auxiliary detection or alarm switches may conveniently be operatively connected to the control amplifier to modify the bias applied to the transmission line.

The central monitoring receiver station of this embodiment is designed for location at headquarters of the local law enforcement agency and includes the novel oscillator-amplifier circuit arrangement, more specifically described below, which produces an audible alarm signal when the acoustic transducer at the alarm transmitter station is actuated. The equipment at the central monitoring receiver station is normally turned off, except for a control amplifier which monitors the bias voltage transmitted by the remote transmitter station over the interconnecting telephone transmission line. The control amplifier at the receiver station is normally biased off by the remote bias voltage energization, but when the remote bias voltage is lowered or removed from the receiver station control amplifier, the control amplifier energizes a silicon controlled rectifier to apply power to the remainder of the receiver apparatus.

The oscillator-amplifier circuit is switch-controlled and normally remains in the position to actuate the oscillator upon application of power by the silicon controlled rectifier of the receiver station control amplifier. When power is applied to the oscillator, an audible alarm signal is produced to attract the attention of the operator to the system. The operator then switches to the amplifier position, which causes the electrical signals transmitted from the remote alarm transmitter station to be reproduced at the central monitoring receiver station. Since the system requires no attention until an alarm signal is received, a plurality of remote transmitter stations can be monitored by a single central monitoring receiver station. Since the receiver station control amplifier of this embodiment is controlled by a D.C. bias voltage rather than by the modulated output of the acoustic transducer, it will not trip, or actuate the oscillator-amplifier, because of a noise signal generated or appearing on the transmission line, but will only be actuated by an actual noise occurring within the protected premises or by actuation of one of the auxiliary alarm switches or devices, such as a light sensitive or thermal sensitive switch, or the like. Any interference with the telephone transmission line, such as a break or short circuit, will cause an alarm condition detection by the receiver station control amplifier and operation of the oscillator-amplifier, since either of these conditions will remove the bias from the receiver station control amplifier and thereby energize the oscillator-amplifier to generate the audible signal within the central station.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings, in which:

FIG. 1 is a block diagram representation of a system with a single alarm transmitter station; and

FIG. 2 is a partial schematic diagram of the system shown in FIG. 1.

FIG. 3 is a schematic diagram of the remote transmitter station of an alternate embodiment of the invention.

FIG. 4 is a schematic diagram of the central receiver station used with the remote transmitter station shown in FIG. 3.

Referring now to the drawing, wherein like parts have been given like numbers, the overall system will be understood readily from FIG. 1 in which the elements are shown functionally by block diagrams. The alarm transmitter station is designated generally by the numeral 1, and the

monitoring receiver station is designated generally by the numeral 2. The transmitter and receiver stations are connected by a telephone transmission line 3.

The alarm transmitter station includes an acoustic transducer 5 which produces an electrical signal upon receipt of acoustic vibrations. The electrical signal produced by the acoustic transducer is amplified by amplifier 7 for transmission along transmission line 3 to the central monitoring receiver station 2. A power supply 9 is provided to energize the amplifier, and this power supply remains on at all times during the operating period of the alarm transmitter station.

The power supply 9 is connected to transmission line 3 by means of lines 11 and 13. This connection provides a constant direct current bias on transmission line 3 at all times while the alarm transmitter station 1 is operating.

A light transducer 15 is coupled to transmission line 3 and serves as an auxiliary alarm unit in addition to the acoustic transducer 5. Thus, the alarm transmitter station 1 will respond to both acoustic and light impulses to furnish an alarm along transmission line 3 to the central monitoring receiver station 2. Moreover, a normally open heat sensitive or thermal switch, TS, when coupled to the transmission line 3 can also serve as an auxiliary alarm unit. Such unit TS will respond to overheating of a protected premises (i.e. close with heat) so as to give an alarm condition with the existence of a fire.

The central monitoring receiver station 2 includes a selection switch 17 which is utilized to select an oscillator stand-by mode or an amplifier-operate mode of reception. The control amplifier 19 is biased to an off condition by the direct current bias from power supply 9 along transmission line 3. The control amplifier 19 is used to energize the power supply 21 when the bias on transmission line 3 is overcome by an electrical signal generated by acoustic transducer 5 and amplified by amplifier 7. This electrical signal turns on control amplifier 19 and energizes a silicon controlled rectifier within power supply 21. Power supply 21 is used to energize an oscillator 23, a preamplifier 25 and an amplifier 27. A speaker 29 provides the receiver station. A pilot bulb is energized also at this time giving a visual indication of the alarm condition.

When switch 17 is in the oscillator stand-by mode, the incoming audio signal on transmission line 3 turns on power supply 21 and causes oscillator 23 to be activated. The frequency of oscillator 23 is chosen in the audio range so that the audio signal on line 3 causes an audio tone from the oscillator 23 to be reproduced by speaker 29 and thus indicate to the operator that alarm transmitter station 1 requires monitoring. The operator then turns switch 17 to the operate mode, and the electrical signal from the alarm transmitter station 1 is routed through preamplifier 25 so that the output of speaker 29 is a direct audio monitoring of alarm transmitter station 1. In this fashion the operator can determine the reason for the tripping of the alarm by alarm transmitter station 1. In some instances an accidental noise will produce such tripping, and the operator can determine this when no further sounds are heard in the system and reset the system at the receiver end. If the security of alarm transmitter station 1 has been violated by an intruder, the additional noises made by the intruder will be picked up at the monitoring receiver station 2, and a law enforcement official can be dispatched to the scene immediately to apprehend the intruder.

The particular circuitry utilized to perform the functions of the system will be understood in connection with the description of FIG. 2 which is a partial schematic of the system.

The details of the power supply 9, the light transducer alarm 15, and heat detector, "thermal SW," are shown within the dotted blocks. The power supply 9 includes a potential source 31, which is shown as a battery.

In practice, however, the potential source 31 would be replaced by an A.C.-D.C. converter arrangement. A silicon controlled rectifier 33 is provided to switch the potential source 31 into and out of the circuit with audio amplifier 7. The control electrode 35 of silicon control rectifier 33 is energized to turn on rectifier 33 by means of switch 37. When switch 37 shorts contacts 39 and 41, the control electrode 35 is connected to potential source 31. In its off position the switch 37 engages contacts 43 and 45 to remove the potential from control electrode 35 and open the circuit from potential source 31 to turn off the silicon control rectifier 33.

The potential source 31 is connected to the telephone transmission line 3 by means of lines 13. Since the audio amplifier 7 is coupled to transmission line 3 by means of transformer 47, the amplifier 7 is effectively isolated from the direct current potential. Diodes 49 and 51 are provided to insure the correct polarity, and bypass capacitors 53 and 55 complete the audio circuitry. Capacitor 55 is in parallel with potential source 31 and is made sufficiently large so that its leak-off time will provide a power failure time delay. This prevents unnecessary alarms at the monitoring receiver station for slight power failures when an A.C. line is utilized as the power source. The auxiliary light sensitive alarm transducer 15 comprises a light sensitive photocell 57 connected to energize the control electrode 59 of silicon controlled rectifier 61, which is effectively connected across telephone transmission line 3 to short out the line. A spring-biased switch 63 is connected in parallel with silicon controlled rectifier 61 to provide manual operation of the alarm. The switch is biased in the open position.

The monitoring receiver station contains the control amplifier 19 which has a voltage divider arrangement shown as three resistors 65, 67 and 69 connected across transmission line 3 through potential source 81. The control tap 71 is positioned so that the bias on the base of transistor 73 holds the transistor in an off condition until an acoustic impulse on acoustic transducer 5 is amplified to overcome the bias and turn on transistor 73.

The collector electrode 75 of transistor 73 is connected to the control electrode 77 of silicon controlled rectifier 79. The silicon controlled rectifier 79 connects and disconnects potential source 81 from the preamplifier 83, the driver amplifier 85 and the output amplifier 27. It will be noted that the preamplifier 83 and the driver amplifier 85 were shown diagrammatically in FIG. 1 as preamplifier 25.

The silicon controlled rectifier 79 has a spring-biased switch 93 connected across its terminals. The indicator lamp 91 is lighted when the power supply is connected to the remaining components, and the switch 93 provides a remote reset of the system by dropping the minimum holding current of SCR 79.

The preamplifier 83 and the driver amplifier 85 are shown with a positive feedback path 95 which enables this combination to function as an oscillator. The switch 17 selects the position where the feedback path is connected to the preamplifier 83 to enable the combination to function as an audio oscillator, or where the audio signal from transmission line 3 is fed into driver amplifier 85 along line 97, and the combination functions purely as an amplifier arrangement.

While this embodiment has been discussed above, there are certain characteristics of this embodiment which have found particular advantage from a commercial operating standpoint.

More particularly, the resistance-capacitance networks associated with the power supply 9 are functionally significant. Condenser 100 prevents misfire of the SCR whereas resistor 104 and condenser 103 provide a forward bias circuit for the SCR and have their respective values so chosen as to give a time delay, preferably of the order of 15 seconds, before the transmitter station becomes effective when the system is initially activated. Thus,

there is a sufficient time delay to permit the operator to leave the premise without activating the system immediately after he has set the system in operation. In other words, there is effectively a "turn-on" time delay to give the merchant or the like sufficient time to leave his store without activating the alarm at the monitoring station.

The capacitors 53 and 55, as indicated above, are also functionally significant since they prevent a short power failure such as commonly experienced in small locations from activating the system. Further in this regard, it should be noted that the rectifier 49 is preferably a silicon rectifier which functions to prevent the transformer from loading the voltage divider at the input of the monitoring station.

Referring now to FIGURES 3 and 4 which together show an alternative embodiment of the invention, the alarm transmitter station shown in FIG. 3 comprises an acoustic transducer (not shown) which produces an electrical signal upon receipt of acoustic vibrations. The electrical signal produced by the acoustic transducer is amplified by means of an audio amplifier preferably of the miniature transistor type, for transmission along a transmission line 3 to the central monitoring receiver station shown in FIG. 4. The amplifier 7 is coupled to the telephone transmission line 3 by means of a line matching coupling transformer 47. The amplifier 7 is energized at all times during operation of the alarm system either from a battery source or from the power lines.

A portion of the audio signal produced by the amplifier 7 is recovered from the collector side of the line matching transformer 47 and fed through a coupling capacitor C1 to a control amplifier 101. The control amplifier comprises an audio amplifier X1, a voltage double circuit, and a D.C. amplifier X2.

The audio signal from the coupling capacitor C1 is fed through an amplitude control variable resistor R1 to the base of audio amplifier transistor X1. The amplified audio output of transistor X1 appearing across collector load resistor R2 is then applied to a voltage doubler circuit comprising coupling capacitor C2, diodes D1 and D2, and capacitor C3. Resistor R3 functions as a load for the voltage doubler circuit as well as a base load for D.C. amplifier transistor X2. Any audio signal remaining in the amplified output of D.C. amplifier X2 is shunted to ground by audio shunt capacitor C4 and the D.C. output appearing across collector load resistor R4, is then applied to the telephone transmission line 12 as a D.C. bias voltage.

Any acoustic noise or sounds occurring within the protected premises will be picked up by the acoustic transducer, fed to the audio amplifier 7, and amplified. This amplified signal is applied to the telephone transmission line 12 through the impedance matching line transformer 47. Under normal, i.e., no noise detected, condition, power supply 9 applies a D.C. bias voltage to the telephone transmission line 3, as in the preceding embodiment. When the acoustic transducer and transistor audio amplifier 7 produce an output electrical signal due to a noise occurring within the protected premises, this output signal is applied to both the telephone transmission line 3 and to the input of the control amplifier 101 through coupling capacitor C1 and amplitude control resistor R1. The first stage of the control amplifier, audio amplifier X1, amplifies the noise signal and applies it to the voltage doubler circuit. The output of the voltage doubler circuit is applied to the D.C. amplifier X2 and then to the telephone transmission line 3 in opposition to the power supply bias voltage appearing across the control amplifier output load resistor R4. The bias signal appearing on the telephone transmission line 3 is therefore a composite of the power supply bias voltage and the control amplifier bias voltage and will therefore drop when an audio signal is detected by the acoustic transducer. The auxiliary keying inputs, such as a light sensitive transducer or a

thermal sensitive transducer are connected across the load resistor R4 and when they are actuated they will shunt the bias voltage to ground, thereby removing the bias voltage from the telephone transmission line to signal an alarm.

Referring now to FIG. 4, the central station monitoring receiver of this embodiment comprises an output amplifier-oscillator, such as a miniature transistor amplifier 102 which serves the same function as the pre-amplifier 83 and driver amplifier 85 of FIG. 2, and a control amplifier 103 which serves a similar function as the control amplifier of FIG. 2, the control amplifier 103 being connected directly to the station termination end of the telephone transmission line 3 and the miniature transistor amplifier 102 being selectively connectable to the telephone transmission line by means of a control switch 17. When the control switch 17 is in the monitoring position, the miniature transistor amplifier 102 is operatively connected as an ordinary audio output or power amplifier to amplify the audio signal generated by the acoustic transducer at the remote transmitter station and transmitted along the telephone transmission line 3 to reproduce this sound by means of loudspeaker 29 and its associated matching transformer TR2.

When the control switch 17 is in the operate position, the miniature transistor amplifier output is applied back to the amplifier input by means of load resistor R13 and D.C. blocking capacitor C8. This supplies a feedback loop corresponding to feedback loop 83 of FIG. 2 whereby the amplifier 102 will function as an audio oscillator producing an alarm audio signal in loudspeaker 29 when the power supply is keyed on by the control amplifier 103 and silicon controlled rectifier SCR. The operation of the control amplifier 103 and silicon controlled rectifier SCR is as follows:

The control amplifier 103 is a two-stage D.C. amplifier which comprises transistors X3 and X4. The D.C. bias voltage normally appearing on the telephone transmission line 3, and on terminating resistor R6 and base load resistor R7, from the remote transmitter station biases transistor amplifiers X3 and X4 to cut-off. When the bias appearing on the telephone transmission line 3 is reduced, transistor amplifier X3 will conduct, which in turn causes transistor amplifier X4 to conduct, firing silicon controlled rectifier SCR and applying power to the miniature transistor amplifier 102.

Specifically, transistor D.C. amplifier X3 is normally maintained in a non-conducting state by the bias voltage applied to the telephone transmission line 3 by the transmitter station power supply. When the bias voltage is decreased, due to a noise actuating the transmitter station control amplifier 101, due to operation of one of the auxiliary inputs, or due to a fault developing in the transmission line 3, the transistor D.C. amplifier will conduct in response to the decrease in bias voltage.

Conduction of transistor D.C. amplifier X3 in turn causes conduction of transistor D.C. amplifier X4 which likewise is normally biased to a non-conducting state.

The output of transistor D.C. amplifier X4 is applied to the silicon controlled rectifier SCR and when transistor D.C. amplifier X4 conducts, this triggers silicon controlled rectifier into a conductive state to supply power to the output amplifier 102. If the control switch 17 is in the operate position, an alarm tone signal will be generated by the feedback loop (R13-C8) and will sound an alarm by means of the loudspeaker 29 to apprise the operator that an alarm condition exists at the remote protected premises. Likewise, any other lowering of the bias voltage appearing on the telephone transmission line 3, such as would be caused by a burglar cutting or shorting the transmission line 3 or a shorting to ground of the bias voltage at the remote transmitter station by an auxiliary keying input would also cause an alarm tone signal to be reproduced by the loud speaker 29, apprising the operator or law enforcement officer on duty of an alarm condition.

Capacitor C6 functions to by-pass any audio signal from the base of transistor X3 so that it will only respond to a change in the D.C. component or bias voltage appearing on the telephone transmission line, and false tripping due to electrical noise on the telephone transmission line is eliminated. Resistor R8 is a collector load for transistor X3, resistors R9 and R10 function as an emitter load and since R10 is adjustable, it functions additionally as a sensitivity control, varying the amount of bias drop necessary to trigger the silicon controlled rectifier SCR from its normally non-conducting state.

Resistor R11 is the emitter load resistor for transistor X4 and resistor R12 is the collector load resistor for transistor X4. Capacitor C7 by-passes any noise signals generated within the control amplifier to prevent false actuation of silicon controlled rectifier SCR.

When transistor amplifier X4 is triggered to conduct, due to a lowering of the bias on the telephone transmission line 3, its output fires the silicon controlled rectifier SCR, and since the miniature transistor amplifier 102 is connected to the silicon controlled rectifier SCR, as a plate load, power is applied to the miniature transistor amplifier 102 causing it to operate as hereinabove detailed.

A reset switch for removing the plate load from the silicon controlled rectifier SCR is provided to return the silicon controlled rectifier SCR to its normal, non-conducting state after being triggered by an alarm condition which may be a separate normally open, spring-biased push button switch 93, as shown and described above, or may be incorporated into the control switch 17 for actuation when the control switch 17 is placed in the monitor position.

In summary, the operation of the two embodiments described above, is similar and they operate as follows:

A power supply in the protected premises applies a bias voltage to a telephone transmission line to bias "off" an alarm device in a central station. When a noise occurs within the protected premises, it is detected by the acoustical transducers in the protected premises which produce an electrical voltage signal corresponding to the noise. This signal is amplified and applied to the telephone transmission line by the remote transmitter station within the protected premises. In the first embodiment described above a control amplifier at a central monitoring station is responsive, to both the bias voltage and the noise signal voltage, to actuate an alarm device upon a change in either the noise signal or the bias voltage.

In the second embodiment described above, a portion of the control amplifier is contained within the transmitter station. The transmitter station control amplifier monitors the electrical signal output of the acoustic transducer and in response thereto will apply a D.C. bias voltage to the transmission line in opposition to the normal bias voltage appearing on the line. The control amplifier at the central monitoring station is responsive in this embodiment only to changes in the bias voltage on the transmission line, specifically, to a decrease in the bias voltage such as would result if a noise occurred.

In both embodiments, the control amplifier of the central monitoring station signals an alarm condition by activating an oscillator-amplifier to generate an audible tone signal in a loudspeaker in response to a change in the input signal received from the telephone transmission line.

A control switch is provided in combination with the oscillator-amplifier operatively connected to alternatively provide an input to the oscillator-amplifier directly from the telephone transmission line or to provide a feedback input from the output of the oscillator-amplifier. When the control switch is in the operating position it provides the above feedback path which will cause an audible tone to be generated when the oscillator-amplifier is provided with electrical power by the central station control amplifier. When a noise occurs within the protected premises, therefore, an audible alarm tone will be emitted

from the loudspeaker if the central station control switch is in the operating position. The operator or law enforcement agent on duty at the central station then operates the control switch to the monitoring position whereby he may listen to any noise being produced at the remote transmitter station to determine whether or not an actual alarm condition exists which requires the dispatch of law enforcement agents to the protected premises.

The system, in addition, provides auxiliary protection inputs such as a light sensitive detector or a thermal sensitive detector which would also cause an alarm tone to be emitted from the central station loudspeaker if either detector is actuated.

Additionally, since the central station control amplifier is controlled by means of a normally present bias voltage on the transmission line and is responsive to a change in voltage on the transmission line the system is fail-safe, that is, an alarm condition will be signaled upon any functional disorder of the transmission line.

It will be appreciated that in a central monitoring facility it is not desirable to have a plurality of audio monitoring units operating simultaneously with no means for calling to the attention of the operator when a significant transmission is being received. The novel oscillator-amplifier arrangement of the present invention provides an ideal solution to this problem since the same circuitry functions as an oscillator alarm to attract the attention of the operator, and then as a monitoring amplifier enabling the operator to monitor the remote station directly after receiving an alarm. The operation of the system is automatic, since the acoustic signal at the remote station is used to trigger on the power supply at the central monitoring receiver station. Since the direct current bias from the alarm transmitter station is necessary to bias off the power supply at the monitoring receiver station, the equipment is fail-safe because an open or short circuit in the interconnecting transmission line, or a failure of the power supply at the remote station will immediately cause the monitoring receiver station to be activated. The incorporation of solid state components permits miniaturization of the units to the extent that they can be located in a very small space and at almost any point desired.

An important aspect of the system operation not yet emphasized, resides in the fact that the system can be reset once being activated. In this regard, it is to be noted that once the alarm signal is heard through the speaker 29, the authority at the monitoring station would normally switch the system to a stand-by condition. In effect, the system would operate as a sensitive listening device during this time. Yet, if the authority heard nothing, he could return the switch so that the system was in "operate" condition. If no noise existed at the transmitter station at this time, the system could be restored to its initial operating condition by depressing reset switch 93. Then, if noise again occurred at the transmitter station, the audio alarm would be heard at the monitoring station. When a plurality of units are simultaneously used at the monitoring station, the ability to remotely reset the system is particularly advantageous. In this regard, it will be understood that the system is adapted to be manufactured in "plug-in" type units whereby a bank of receiving stations can easily be provided at a police station, or the like. Of course, it will be further understood that the system cannot be reset if light is incident on photocell 57 or if noise remains, i.e., the alarm signal will immediately be heard if an attempt is made to reset the system under these conditions.

The auxiliary light sensitive alarm 15 is more or less an attachment which can be used with the basic system. In some instances, this attachment would not be desired, whereas in other instances, the attachment would be particularly suitable as for example, where it could be placed in a cash register, vault or the like.

Various modifications can be made in the preferred

embodiment presented without departing from the scope and spirit of the invention.

What is claimed is:

1. An alarm system comprising in combination first and second stations and an electrical transmission line coupled therebetween, said first station including acoustic transducer means for producing an A.C. electrical signal output in response to acoustic vibrations, amplifier means coupled to said acoustic transducer and to one end of said transmission line, said amplifier means being responsive to an A.C. signal output from said transducer for supplying said A.C. electrical signal output to said line, and a first D.C. power supply means coupled to said first amplifier means for energizing said amplifier and to said one end of said transmission line for placing a first level of D.C. voltage signal upon said line, said second station including energizable audio reproducing means for producing an audible output from said A.C. electrical signal output as received over said line, second D.C. power supply means having a D.C. voltage level, switching means for connecting said second D.C. power supply means with said energizable audio reproducing means, and comparison means coupled between the other end of said transmission line and said second D.C. power supply means for producing an output in response to variation in the comparative level of signals received by said comparison means from said transmission line and said D.C. voltage level of said second D.C. power supply means respectively, said switching means being coupled to said comparison means for operation of said switching means to connect said second power supply means with said energizable audio reproducing means in response to a predetermined output from said comparison means.

2. The alarm system defined in claim 1 wherein said first power supply means includes switching means operative in respectively alternate conditions to connect said amplifier means to said first D.C. power supply means and disconnect said amplifier means therefrom.

3. The alarm system defined in claim 2 wherein said switching means comprises a silicon controlled rectifier circuit, a source of D.C. power, and a manually operative switch for connecting said silicon control rectifier circuit with, and disconnecting said silicon control rectifier circuit from, said source of D.C. power, said silicon control rectifier circuit being operative when connected with said source of D.C. power to power said amplifier means.

4. The alarm system defined in claim 1 and further including an auxiliary transducer means responsive to radiation incident thereon to change said first level of D.C. voltage upon said line.

5. The alarm system defined in claim 1 and further including an auxiliary transducer means responsive to heat to change said first level of D.C. voltage upon said line.

6. The alarm system defined in claim 1 and further including transformer means, said amplifier means being coupled to said transmission line through said transformer means, said first D.C. power supply means being directly connected to said transmission line.

7. The alarm system defined in claim 6 and further including capacitor means connected in parallel across the connection between said first D.C. power supply means and said transmission line, said capacitor means being operative to substantially maintain said first level of D.C. voltage signal in the event of temporary failure of said first D.C. power supply means.

8. The alarm system defined in claim 1 wherein said comparison means comprises a voltage divider network.

9. The alarm system defined in claim 8 wherein said switching means comprises a transistor amplifier coupled to said comparison means to receive said predetermined output therefrom and a silicon controlled rectifier circuit responsive to operation of said transistor amplifier to connect said second D.C. power supply means with said energizable audio reproducing means.

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10. The alarm system defined in claim 9 wherein said energizable audio reproducing means comprises an amplifier-oscillator circuit, an output transducer for audibly producing the output of said amplifier-oscillator circuit, and switching means for switching said amplifier-oscillator circuit into respectively different amplifier mode of operation and oscillator mode of operation.

11. The alarm system defined in claim 10 wherein said amplifier-oscillator circuit comprises amplifier means and a feedback loop.

12. The alarm system defined in claim 1 wherein said comparison means comprises transistor amplifier means.

13. The alarm system defined in claim 12 wherein said switching means comprises a silicon controlled rectifier circuit responsive to the operation of said transistor amplifier means to connect said second D.C. power supply means with said energizable audio reproducing means.

14. The alarm system defined in claim 13 wherein said energizable audio reproducing means comprises a transistor amplifier circuit and a feedback including a feedback control switching means therein, said feedback switch being operative to alternately close said loop to cause said amplifier to function as an oscillator and to open said loop to permit said amplifier to function as an amplifier connected to said transmission line.

15. The alarm system defined in claim 1 and further including bias control means coupled to said amplifier means for receiving a portion of said A.C. electrical output and to said first D.C. power supply means, for

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varying the bias feed by said first D.C. power supply means to said transmission line in accordance with said A.C. electrical output from said amplifier means.

16. The alarm system defined in claim 15 wherein said bias control means comprises amplifier means and a voltage double network.

17. The alarm system defined in claim 15 wherein said comparison means comprises transistor amplifier means, said switching means comprises a silicon controlled rectifier circuit responsive to the operation of said transistor amplifier means to connect said second D.C. power supply means with said energizable audio reproducing means.

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