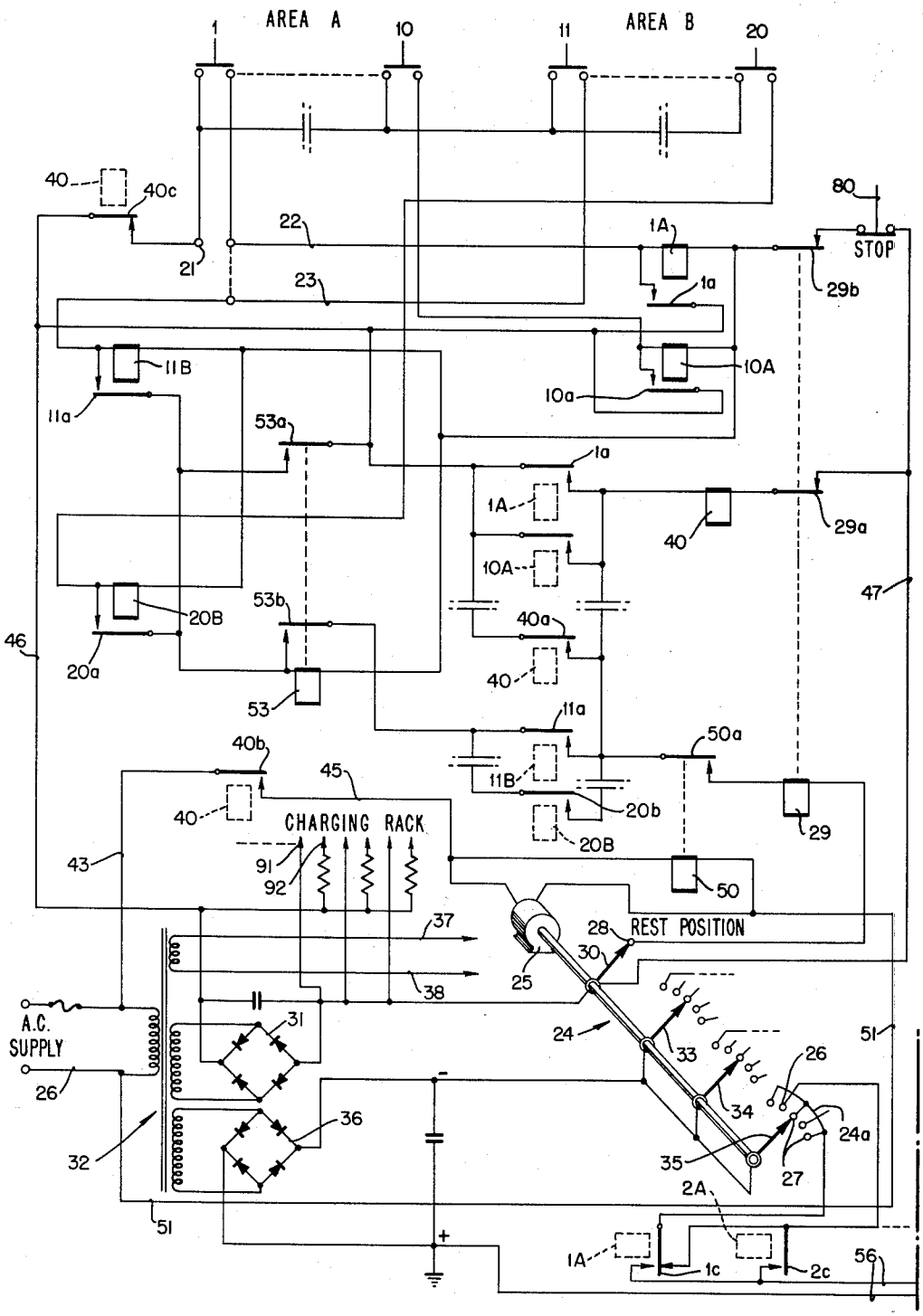
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PAGING AND ALARM SYSTEM

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Fig. 1a

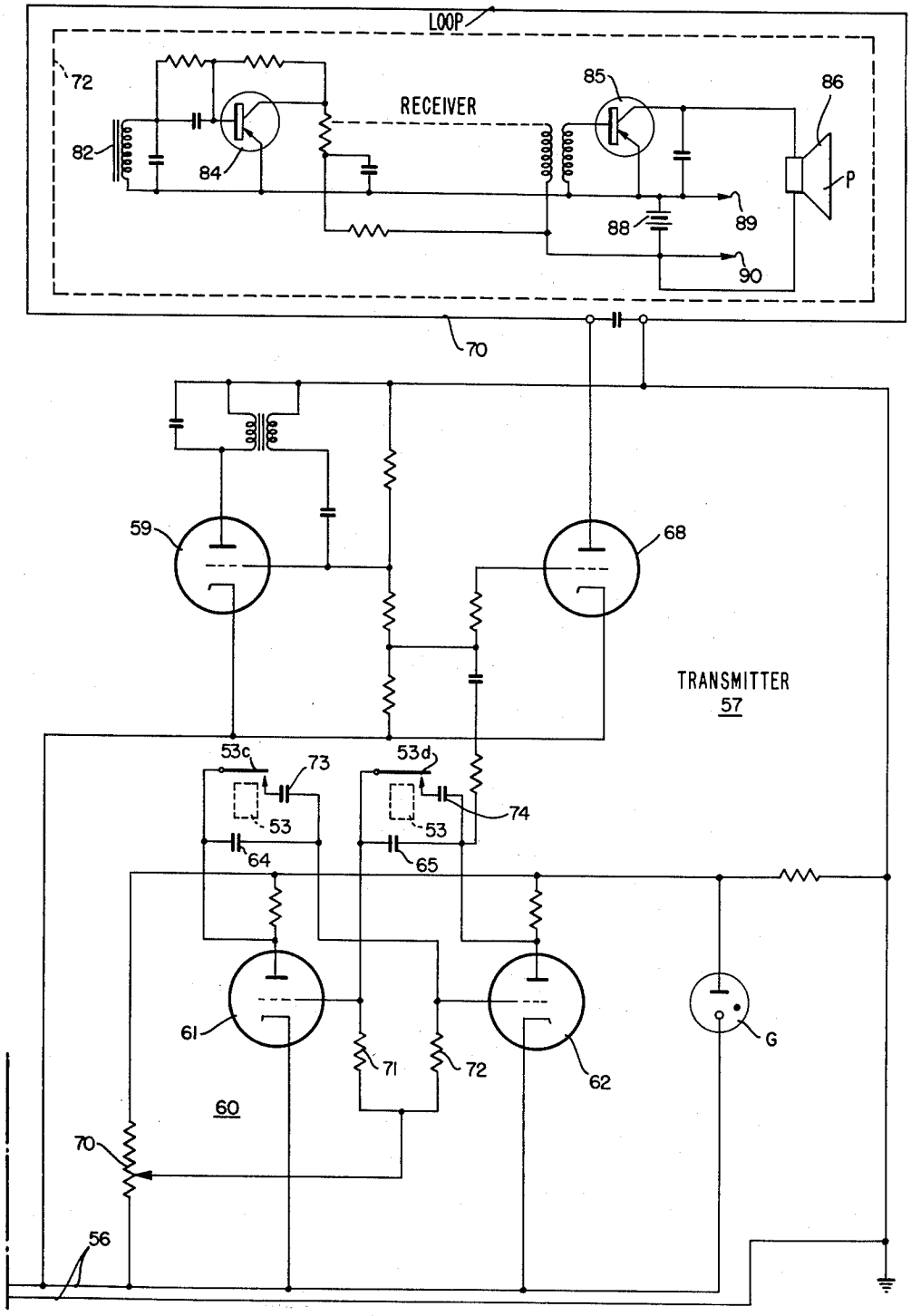


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Fig. 1b



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# PAGING AND ALARM SYSTEM

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This invention relates to paging systems and more particularly to security or alarm systems.

Heretofore in known security or alarm systems guards or other security personnel had been alerted to the fact that something is wrong by using an audio or visual alarm generally without identification as to the specific location from which the alarm is sounded. Closed-circuit television has recently been used in security or protective systems, as for example, in banks. The TV systems are complex and expensive; they require a plurality of TV cameras along with a complex console arrangement in which monitor receivers are housed for receiving the picture transmitted from their respective cameras. The monitors must be constantly observed by a guard.

It is a principal object of the present invention to provide a simple, inexpensive and effective wireless security or alarm system for transmitting an alarm signal to guards and other appointed persons without others knowing the fact that the transmission is being made.

Another object is to provide a security system by which a calling station or point from which transmission is made is identified so that security personnel may be alerted to the existence of trouble at this point and collective action can be taken to correct the trouble, as for example, the guards can collectively converge at the point of transmission.

A feature of the security system according to the invention is that distress calls, alarms or other information can be transmitted through the air to guards and to any appointed persons identifying any of several transmission points at which the call or alarm has been initiated and doing so quietly and unknown to other persons as indicated heretofore. Calls are initiated by push-buttons or other noiseless electric switches by single momentary contact. These switches can be actuated manually, or by foot or knee pressure, or they can be operated automatically, for example, by the motion of doors, windows, etc., in known manner. Alternatively this can be a maintained contact, or the opening of a normally closed contact. The system includes remote transmitting equipment, which is constantly in stand-by operating condition, which instantly starts sending out a signal identifying the sending station and its general location, or other desired coded messages, upon actuation of a push-button or noiseless switch. This signal can be repeated several times and then be shut off automatically, or it can alternatively continue until shut off by manual actuation of one of any number of conveniently located stop buttons.

In order to receive the call signals each guard carries a small pocket transistorized receiver and is able to hear the signal as a series of humming or buzzing sounds suitably coded to identify the calling point. The hum can be of different tones, to designate different areas, simultaneously transmitted with the code identification of the exact point of the call within a given area. The individual receivers can be constructed with a visual signal means, as



for example, one or more small lamps energized on reception of the call signal. This light can be used instead of or at the same time that the audio means is employed.

An especially valuable feature of the system is the mobility of the guards, since they are free to move about, attend to routine duties, mingle with employees and visitors, observe the actions of all persons and maintain general supervision without hindrance. They are not restricted to fixed probably conspicuous booths or stations in order to receive distress calls, and the calls are still secret so as not to alarm others.

Another feature of the system is that the transmitter can be modified so that recorded or voice calls can be transmitted to the receivers in addition to coded signals or in place of them.

Other features or advantages of the protective system in accordance with the present invention will be better understood as described in the following specification and appended claims in conjunction with the following drawings in which:

FIG. 1*a* is a schematic diagram of transmitter circuitry and is illustrative of a relay and code switching section of a remote transmitter apparatus of the security system according to the invention;

FIG. 1*b* is a schematic diagram of the circuits of the transmitting equipment and the circuit of an individual portable receiver usable as part of the protective system.

While the protective system in accordance with the invention will be described as applicable to a bank for the security thereof it will be understood the system is usable anywhere where such systems are employed such as stores, warehouses, etc.

According to the drawings a remote transmitting station is provided on a transmitter apparatus comprising a relay and code switching section, FIG. 1*a*, for keying electron tube transmitting equipment as hereafter disclosed. The relay section is provided with a plurality of push-buttons, as for example, twenty push-buttons, 1–10 and 11–20 arranged at separate caling points. The push-buttons are divided into two groups of ten to represent two areas, A and B, each with ten calling stations or points from which an alarm signal can be initiated. The push-buttons are disposed at points which may need to transmit an alarm. For example, assuming that the security system is in a bank, the several calling stations may be teller positions or cages so that each teller can easily transmit a call or alarm to guards equipped with individual receivers as later hereinafter disclosed. It being understood that the individual switch or push-button is conveniently located so that it can be actuated, without anyone observing the operation, for example, by pressing it with the knee or foot.

Each push-button is connected to a common terminal 21 o none side and to its individual terminal on the other through leads 21 and 23 respectively and thus to a respective relay, 1A to 10A and 11B to 20B. In order to simplify the drawings only a few of the push-buttons and associated relays are shown. Each relay is of the three pole double throw type, for example, contacts $1_a$, $1_b$ and $1_c$ represent the three poles of relay 1A. Contacts $10_a$, $10_b$, $10_c$ to $20_a$, $20_b$ and $20_c$ are shown operatively associated with respective relays 10A to 20B.

A multi-position multi-deck rotary switch 24 is provided for initiating coded signals as hereinafter described.

The switch 24 is driven by a motor 25 electrically connected to a power supply source 26. The speed at which the motor drives the switch 24 is related to the number of switch contacts in switch 24 and is in the range of one to ten revolutions per minute. Switch 24 is a continuous rotation type switch breaking between contacts. Its decks, for example deck $24_a$, are wired to give the desired codes representative of the various call points. The contacts are selected by the relay contacts $1_c$, $2_c$, etc. For example, contacts 26 and 27 are connected so that they can be placed in circuit or selected by contacts $1_c$ and $2_c$ when relays 1A and 2A are respectively energized. Switch 24 is constructed with an upper deck in which only one contact 28 is provided corresponding to a rest position at which the switch rests when in a stop condition. Contact 28 is electrically connected to a relay 29 having contacts $29_a$, $29_b$ and functioning as later disclosed.

Switch 24 is constructed so that a rotary contact 30 establishes a circuit to contact 28 from a rectifier bridge circuit 31 supplied with power from power supply 26 through a transformer 32. Other rotary contacts 33, 34, 35 are electrically connected to a rectifier bridge circuit 36 also supplied with power through a secondary winding of transformer 32 as shown. Filament connections or leads 37, 38 are provided in the secondary of transformer 32 for use hereinafter disclosed.

A relay 40 is provided having its operating coil electrically energized from circuit 31 and a movable contact $40_b$ for establishing a circuit through to motor 25 from supply source 26 through leads 43, 45. Relay 40 is of the three pole double throw type and has contacts $40_a$ normally open and contact $40_c$ normally closed. Movable contact $40_c$ connects terminal 21 electrically to bridge circuit 31 through lead 46 so that the relays can be electrically energized from across bridge circuit 31 through leads 46 and 47.

A time delay relay 50 is connected across the power supply 26 by leads 43, 45 and 51 is provided with a normally open contact $50_a$ operable to a closed position when relay 50 is energized for controlling the number of revolutions that motor 25 can make during the time delay period of relay 50. Time delay relay 50 controls the repetitions of a code signal to be transmitted by the calling station in a manner hereinafter disclosed.

A four pole single throw relay 53 electrically connected to relays 11B to 20B of area B and energizable only in the event that push-buttons 11 through 20 are actuated is provided with four contacts $53_a$, $53_b$, $53_c$ and $53_d$, all of which are normally open.

Assuming that an alarm is to be transmitted from calling station 1, in area A, push-button 1 is operated allowing relay 1A to be electrically energized thereby closing its contacts. Contact $1_c$ being a double throw contact, will disconnect any unwanted *c* contacts to the right of it shown in the lower right hand corner of FIG. 1*a*. Contact $1_a$ acting as a holding contact seals in and holds the relay 1A closed after the push-button 1 is released. Contact $1_b$ being closed relay 40 is electrically energized closing its contacts so that contact $40_a$ acting as a holding contact seals in and holds it closed while contact $40_b$ allows the motor 25 to be energized. Contact $40_c$ opens thereby preventing interference by any attempt at subsequent calls during the time that an alarm is being transmitted.

The motor 25 drives rotary switch 24 so that it makes a series of spaced single contacts, as for example, contacts 27 arranged in a code sequence signifying or representative of call point 1. During the time each contact is made by switch 24 a circuit is established through leads 56 across bridge circuit 36 thereby to apply plate voltage to a transmitter 57 in which a carrier frequency is generated by an oscillator 59 and its related oscillatory circuitry. This carrier frequency is modulated at an audible frequency supplied by a multi-vibrator 60 employing two tube elements 61, 62 with the output of each cross connected or coupled through capacitors 64, 65.

The modulated carrier is applied to an output stage or tube 68 where it is amplified and then fed to a transmission loop 70. The modulated carrier frequency is heard as a hum signal in the individual radio receivers 72 carried by the guards. The tube elements of transmitter 57 are provided with filament voltage in the usual manner from the leads 37, 38 of transformer 32.

The tone of the hum heard in the receivers 72 is the modulation frequency. The carrier frequency can be chosen for the best overall design and will usually be below fifty kilocycles. If the carrier frequency is down at the audible range, below 20,000 cps., it can be employed to transmit code signals without requiring modulation but at the sacrifice of tone control and voice transmission if the latter is provided for. The modulation frequency is set at any desired audible frequency by a potentiometer 70 and resistors 71, 72 in combination with capacitors 73, 74 of the multi-vibrator circuit 60.

When an alarm or call is sent out from area A, the relay 53 remains inactive. Contacts $53_c$ and $53_d$ remain open and the tone of the hum heard in the receivers depends on the value of the two capacitors 73 and 74. If the alarm or call is sent out from area B, as for example, from station 11 corresponding to push-button 11 then relay 53 is electrically energized and contacts $53_c$ and $53_d$ close connecting capacitors 73, 74 in parallel with capacitors 64, 65 respectively, thereby reducing the modulation frequency. The reduction in modulation frequency lowers the tone of the hum or call signal. The change can be made to make the hum signal correspond to any desired interval of the musical scale so as to be readily distinguishable. The tone of the hum immediately indicates the area from which the call is initiated at the very instant that the coded signal is initiated. A number of areas can be so identified up to the limit of recognizable intervals of the musical tone scale. Identifying the area from which an alarm or call is transmitted immediately permits security personnel to ascertain the general area of the alarm with the specific point or position in the area being identified by a coded signal transmitted by the coded signal controlled by switch 24.

Those skilled in the art will immediately perceive that tone change in coding can be combined in various ways to advantage. If the number of calling points is not too great the points themselves can be identified entirely by tone without coding.

As indicated heretofore a distress call sent out by the transmitter will be repeated a certain number of times before stopping automatically. The number of repetitions is determined by the number of code signals the rotary switch 24 can give per revolution times the number of revolutions permitted by the timing relay 50. For example, if switch 24 has twenty contacts per deck then one deck can be connected to conduct to nine twice per revolution. Now if relay 50 is constructed to close before switch 24 completes one revolution then relay 29 will operate to stop switch 24 so that rotary contact 30 is at rest position 28 at the end of its first revolution. At the same time, contacts $29_a$ and $29_b$ will open and reset all the other relays. However, if relay 50 is set to close after one revolution and before the second revolution the rotary switch 24 will go past its rest position once and stop when it completes the second revolution thus counting up to nine four times. By employing a plug-in thermo-type relay as relay 50 it can be changed readily to permit any desired number of revolutions of switch 24. On the other hand, if relay 50 is removed permanently or disconnected electrically, as for example, by a disconnect switch, not shown, then switch 24 will be driven continuously once started and the distress call will be repeated until a stop button 80 is depressed or the relay 50 is restored to operation.

The loop 70 is tuned to resonate at the carrier fre-

quency and is capable of creating an alternating electromagnetic field for transmission of signals, as is known and currently employed in the art. This electromagnetic field comprises both an induction field and a radiation field.

The transistorized radio receivers are provided with vertical ferrite rod antennas 82 to pick up the electromagnetic field from loop 70 by induction. A transistor 85 and associated circuitry are provided for detecting the modulation of the incoming signal and a transistor 84 provides one of several amplifying stages so that the modulation frequency transmitted, whether a hum or voice message, is audible in a reproducer which may be a speaker 86, or earphones not shown. It will be understood that the transistorized receivers as shown, are of the type employing four or five transistors and the intermediate stages not shown, are resistance and capacity coupled in known manner. For greater sensitivity, where required, more transistors in a superheterodyne or a superregenerative circuit may be used.

The individual receivers 72 are provided with a battery 88 connected to provide biasing voltages for the transistors 84 and 85. The battery 88 is rechargeable through external contacts 89, 90 which are disposed on the receiver housing, not shown, and cooperate with a pair of direct current charging contacts 91, 92 electrically connected, to the bridge rectifier circuit 31, FIG. 1*a*, of a charging rack in which the individual receivers are stored when not in use. Other pairs of charging contacts are provided in the charging rack as shown for the individual respective receivers.

The receivers may be constructed with tuned relay contacts, not shown, in series with the phones or reproducer in known manner to emit a louder buzzing sound in locations where this is permissible and desirable. On the other hand, in locations where the signal must not be heard by any other person than the person carrying the receiver earphones may be provided connected to the receiver with a cord and worn in any of the known ways such as in the ear, behind it or in an earpiece of horn rimmed glasses. Moreover, a small loudspeaker may be concealed on the person so as to be heard of felt by the wearer but not others.

The receivers do not provide for a callback system. In locations where this feature is desirable a wired intercommunication system can be included connecting the transmitting station with any number of call-in stations in a two-way communication system so that when a signal is received in the transmitter the one carrying the receiver may call in to the transmitting station.

It will be understood by those skilled in the art that the transmitting frequency, and the loop type antenna, described above, are not essential to the operation of the system. There is no inherent requirement regarding either one, a higher or lower frequency can be employed in any of the available bands, and various type antennas suited to the chosen frequency can be used.

While a preferred embodiment of the invention has been shown and described it will be understood that many modifications and changes can be made within the scope of the invention.

What I claim and desire to secure by letters patent is:

1. In a paging and alarm system in combination, remote transmission equipment for generating and transmitting electromagnetic waves corresponding to coded call signals, means comprising separate switching means at separate call stations remote from the transmission equipment and connected thereto for initiating the call signals in an individual code representative of the call station initiating the call signal and tone-coded to an individual tone a tone representative of a geographical area in which said call station is located, and a plurality of portable individual receivers for receiving the coded call signals.

2. In a paging and alarm system in combination, a loop antenna, remote transmission equipment for generating and transmitting from said antenna electromagnetic waves corresponding to coded call signals, a switching section in said equipment comprising separate individual switching means at separate call stations remote from the transmission equipment for initiating the call signals in an individual code representative of the call station initiating the call signal and tone-coded to an individual tone a tone representative of a geographical area in which said call station is located, and a plurality of portable individual receivers for receiving the coded call signals.

3. In a paging and alarm system in combination, a loop antenna, remote transmission equipment for generating and transmitting from said antenna electromagnetic waves corresponding to coded call signals, a switching section in said transmission equipment comprising separate individual switching means at separate call stations remote from the transmission equipment and a rotary switch for initiating the call signals in an individual code representative of the call station initiating the call signal means in said equipment responsive to the individual switching means for initiating the call signal tone-coded to an individual tone a tone representative of a geographical area in which said call station is located, and a plurality of portable individual receivers for receiving the coded call signals.

4. In a paging and alarm system in combination, a loop antenna, remote transmission equipment for generating and transmitting from said antenna electromagnetic waves corresponding to coded call signals, a switching section in said transmission equipment comprising separate, individual switching means at separate call stations, remote from the transmission equipment and a driven rotary switch for initiating the call signals in an individual code representative of the call station initiating the call signal, multi-vibrator means in said equipment responsive to the switching means for initiating the individual call signals tone-coded to individual tones representative of individual respective geographical areas in which said call stations are located, a plurality of portable individual receivers for receiving the coded call signals, means connecting said switching means in a plurality of groups and each group connected in a respective geographical area.

5. In a paging and alarm system in combination, a loop antenna, remote transmission equipment for generating and transmitting from said antenna electromagnetic waves corresponding to coded call signals, means comprising separate switching means at separate call stations, remote from the transmission equipment and circuit interrupting means for initiating the call signals in an individual code representative of the call station initiating the call signal, means connecting said switching means in a plurality of groups, each group being disposed in a respective geographical area, means in said equipment responsive to the individual switching means for initiating the call signal tone-coded to a given tone representative of a geographical area in which said call station is located, and a plurality of portable individual receivers for receiving the coded call signals.

6. In a paging and alarm system in combination, a loop antenna, remote transmission equipment for generating and transmitting on said antenna electromagnetic waves corresponding to coded call signals, means comprising separate switching means, at separate call stations, remote from the transmission equipment for initiating the call signals tone-coded to an individual tone code representative of the call station initiating the call signal, capacitance means in said equipment to vary the tone of the call, and a plurality of portable individual receivers for receiving the coded call signals.

7. In a paging and alarm system in combination, a loop antenna, remote transmission equipment for generating and transmitting from said antenna electromagnetic waves corresponding to coded call signals, a switching

section in said equipment comprising separate means comprising individual switching means at separate call stations remote from the transmission equipment for initiating the call signals in an individual code representative of the call station initiating the call signal and tone-coded to an individual tone corresponding to a tone representative of a geographical area in which said call station is located, said means for initiating said call signals including means to repeat the individual call signals indefinitely and for a preselected period of time once initiated and means to terminate the individual calls at will, and a plurality of portable individual receivers for receiving the coded call signals.



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