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3,288,933

AUTOMATIC DIAL TELEPHONE ALARM WITH TWO-SPEED MOTOR

Filed May 8, 1963

2 Sheets-Sheet 1

FIG. 1

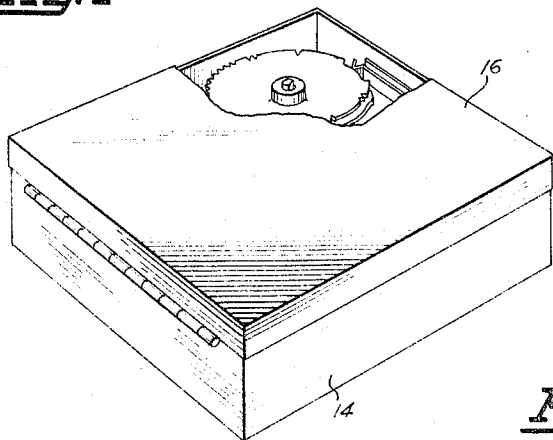


FIG. 4

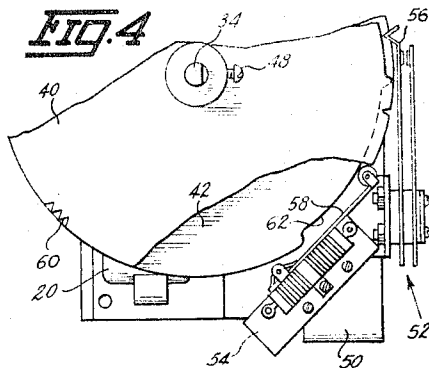


FIG. 2

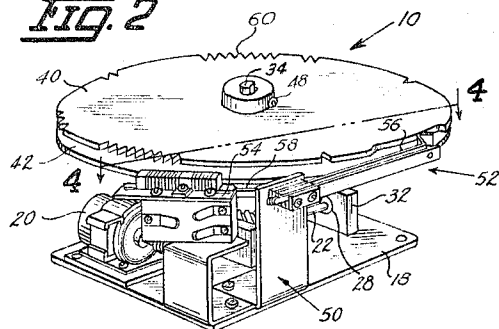
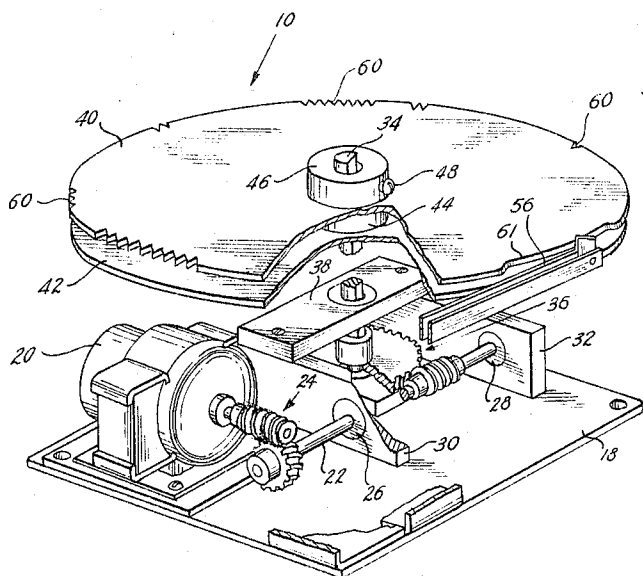


FIG. 3

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Fig. 5

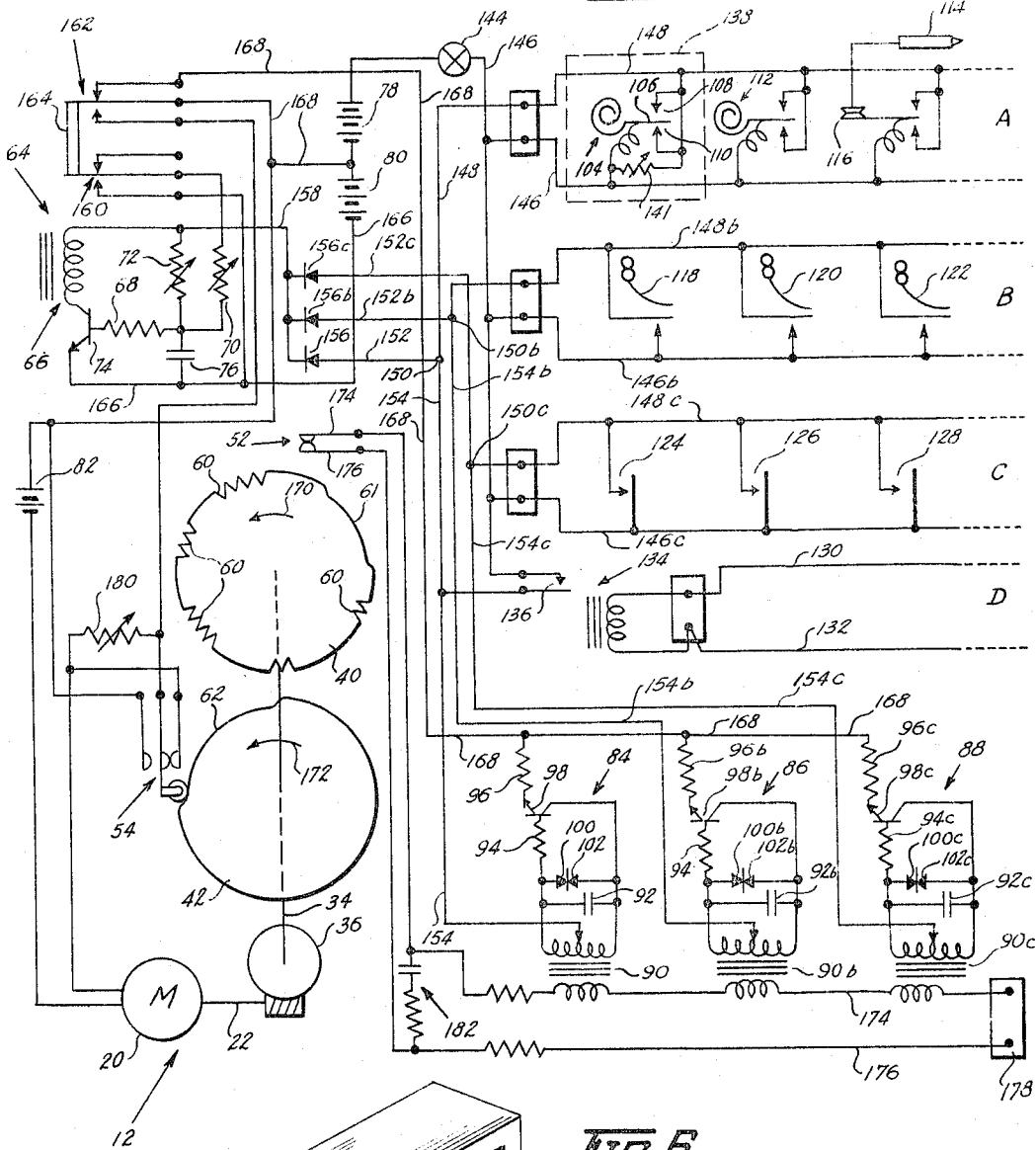
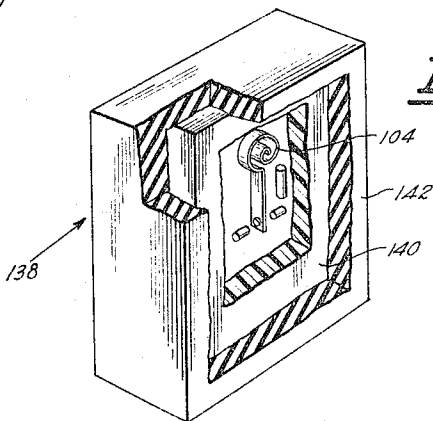


Fig. 6



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AUTOMATIC DIAL TELEPHONE ALARM WITH TWO-SPEED MOTOR

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20 Claims. (Cl. 179-5)

This invention relates to an improved electrically operated alarm system which uses regular telephone lines to automatically transmit a signal to a predetermined telephone station under predetermined conditions.

One of the important objects contemplated by this invention is the provision of an alarm system of the above class which will simultaneously monitor a plurality of functions or situations such as fire, burglary and refrigeration temperatures, and in the event of such situations or malfunctioning of mechanism for refrigeration, for example, notification of the same is automatically transmitted by telephone to a predetermined telephone station of some responsible person.

Another important object includes an alarm system as characterized which does not expend any energy while monitoring a given situation or function and is completely independent of any outside source of power except the use of telephone circuits. In this respect, monitoring stations which are actuated in response to temperature changes such as for fire or malfunctioning of refrigeration utilize bi-metal sensors of any conventional type and in other situations such as for burglary and flood, trippable micro switches or the like are employed to close the proper circuitry.

This invention has certain novel features particularly useful in detecting dangerous temperature levels in refrigerated areas such as large walk-in coolers and the like. In the refrigeration apparatus for such areas, it is well-known that ice builds up on the coils from time to time because of moisture in the circulated air and that, therefore, such apparatus is commonly provided with what is called the defrost cycle where such apparatus is either slowed or completely inactivated for a given interval to permit the ice to melt. Such cycles may vary from a few minutes to several hours with different equipment and during a longer cycle, while the air in a cooled area may have reached a temperature that would be considered dangerous, if maintained, yet frozen cartons or packages of food within such area, may be sufficiently insulated so that the temperatures of the contents are clearly still at safe temperatures. On the other hand, contents in a cooled area may reach a high dangerous temperature level before the end of a too long defrost cycle or because of apparatus or power failure. The use of time delay mechanisms coordinated with an alarm system and the defrost cycle are present in some installations but since different apparatus have different defrost cycle periods, a large installation may require a great number of differently set time delay switches. With this problem in mind, it is noted that the important factor is the temperature of the food involved in the cooled area and therefore one of the features of this invention is to provide a sensing device in my alarm system for use in refrigerated areas that is responsive to temperature changes to the same degree as the food in such area and will actuate the alarm only when the food temperature approaches the danger point irrespective of the length of the defrost cycle or the temperature of the surrounding air.

More particularly, it is an object herein to provide a sensing element for use in refrigerated areas which has the same heat equivalent and warm up characteristics as the average food packet in the area being monitored.

Still another object of this invention is the provision of a plurality of tone generators, each having an identifying characteristic tone related to a predesignated situation or

subject such as fire, flood, burglary or refrigeration so that the recipient of the alarm signal will be immediately apprised of the source of the alarm.

Another feature of this invention relative to the use of the telephone circuit includes means for dialing a predetermined telephone number, holding the connection for a set interval during which the characteristic tone is transmitted, breaking or disconnecting the telephone circuit or in effect "hanging up" for a given time interval and then repeating the call and disconnection until someone responds to the alarm and deactuates the dialing mechanism. During the break or "hang up" period, the telephone line is not tied up for other calls.

To attain these objects and such further objects as may appear herein, or be hereinafter pointed out, reference is made to the accompanying drawings forming a part hereof, in which:

FIG. 1 is a perspective view showing the compact box-like container in which this invention is mounted, with portions of the lid cut away to show the dialing disks,

FIG. 2 is a perspective view of the dialing disks and driving mechanism therefor,

FIG. 3 is an enlarged exploded view similar to FIG. 2 but with bracketing removed to more clearly illustrate the construction thereof,

FIG. 4 is an enlarged fragmentary top view taken from the line 4-4 of FIG. 2,

FIG. 5 is a wiring diagram of the circuitry used with this invention with the driving mechanism and dialing discs shown schematically and related thereto, and

FIG. 6 is a perspective view of my new auxiliary sensing device for use in monitoring food temperatures, with the same partially cut away to more fully illustrate the construction thereof.

Referring to the drawings, this new alarm system, except for the remotely located sensing devices to be later identified, which includes the electrically operated mechanism shown generally at 10 in FIGS. 2 and 3 and the circuitry 12 in FIG. 5 is conveniently and compactly arranged in the box-like housing 14 having the hinged lid 16. Stated simply, this alarm system is designed to monitor one or more given situations as described above, and, when the limits of the situation have been overrun, to automatically call a predetermined telephone number and place a distinguishing characteristic sound on the line so that the person answering will be apprised of the area in trouble.

The mechanism shown in FIGS. 2 and 3 is referred to as the dialing mechanism and is mechanical in function though electrically activated as will later appear. This mechanism performs the function of dialing the telephone number of a person who is to be notified of impending trouble and then holding the connection for a given time while a tone characterizing the type of difficulty is sent to the called party. It also disconnects or "hangs up," releasing the telephone equipment for an interval of time before redialing the same number. The dialing mechanism is made to go through the same procedure over and over until someone comes in to investigate and then turns the alarm off. Re-cycling is necessary because of a possibility of a busy line at the time of the first or second call. During the "hang up" interval, the telephone equipment is released and is not tied up for an indefinite period of time. This alarm system functions as any normal telephone call would be placed.

The dialing mechanism has been constructed with a minimum of parts to assure its dependable operation and as seen in FIG. 3, these are mounted to the bottom or base 18 of housing 14. A permanent magnetic motor 20 is used as the driving source and rotates a horizontal shaft 22 by the worm gear connection 24, shaft 22 being suitably journaled in spaced bearing members 26 and 28

disposed in the respective spaced support blocks 30 and 32. A vertically disposed shaft 34, connected at the bottom to shaft 22 by speed reduction gears 36, extends upwardly through a crossbar 38 secured to blocks 30 and 32, and carries the two vertically spaced concentrically mounted cam discs 40 and 42. A spacer member 44 is interposed between the discs and a washer-like cap 46 with set screw 48, is placed on shaft 34 above the uppermost disc 40 for obvious reasons.

Bracket assembly 50 on base 18 carries the two electrical switching assemblies 52 and 54 which include the contact points as shown in FIG. 5 and of which one such point in each assembly is on the end of a movable spring arm, 56 and 58 respectively, as shown in FIG. 4. Assemblies 52 and 54 are designed to engage the periphery of the respective discs 40 and 42 as the discs rotate and to be opened and closed in accordance with the spacing of the peripheral notches 60 and 61 in cam 40 and notch 62 in cam 42. The notches 60 in disc 40 represent the telephone number to be dialed, the notch 61 provides a disconnect or hang up interval between dialings, and the notch 62 in disc 42 provides for a start and stop cycle as will be referred to later. With the foregoing mechanical structure, the motor 20, on one end of the gear train, is allowed to operate at speeds that give good stability and torque, while at the reduced end the cam plates rotate at the correct speed to give the dialing contacts the proper dialing rate—a rate required by the telephone dialing system.

One of the important features of the dialing mechanism is the shifting from the regular dialing speed to a very slow speed electronically and this is accomplished by the cooperation of several elements which as a group I have called a pulse generator that is designated generally by the numeral 64 (FIG. 5). Making up the components of the pulse generator are the relay coil 66, one fixed resistor 68, two variable resistors 70 and 72, transistor 74 and condenser 76 which are placed in circuit 12 as shown and which includes the batteries 78, 80 and 82.

In the circuitry of this alarm system, provision is made for any desired number of tone generators of which three are shown for illustration and designated generally by the numerals 84, 86 and 88. Each tone generator has a characteristic tone that is different from the others to represent a particular type of trouble. For example, a tone generator of 200 c.p.s. may represent an alarm of a refrigeration difficulty and a tone generator of 800 c.p.s. with varying intensity may represent a burglar or break-in alarm. Other tone generators of a variable frequency up and down may represent a fire alarm, flood or any special situation being monitored. Thus as the receiver of each alarm call listens to the tone generator, he is immediately cognizant of what trouble he is to find. It will thus be appreciated that many variations can be built into tone generators for each function they represent and, in this system, each generator is selected by means of a circuit without relays. The tone generators shown, 84, 86 and 88, are similar in structure so that like parts are given like numbers and comprise one output transformer 90, a condenser 92, two resistors 94 and 96, a transistor 98 and two zener diodes 100 and 102. Output voltage is held constant by the zener diode regulators and these regulators also protect the transistor 98 from high induced pulses during the dialing interval.

Another important feature of this alarm system resides in the fact that preferably no energy in the form of electrical power is consumed during the time that the system is performing its monitoring functions and it is only when the limits are overrun and an alarm is needed, will current flow from the batteries. This feature can be employed most satisfactorily in areas where temperature sensitive sensors can be used and thus in monitoring circuit A for monitoring refrigeration circuits, I have used a bi-metal coiled element 104 where the center is fixed and the outer end is bent to form a movable arm 106 that

moves in response to temperature changes to engage one of the contacts 108 or 110, with the distance between arm 106 and the respective contacts 108 and 110 determining the degree of temperature change allowed before the circuit is closed in a well-known manner. Element 112 is the same as 104, and in parallel therewith, and merely represents an additional monitoring station. Also in circuit A, I show the use of the well-known capillary bulb 114 which can be used to place the contact points 116 at a remote point if danger from condensation is present.

In circuit B which I use for monitoring fire situations, the like sensors 118, 120 and 122, which are generally of a well-known type, use a standard enclosed micro switch actuated by a phosphor bronze spring released when a heat fuseable metal melts. These devices will be, installed at the ceiling or high places where heated air from fire will concentrate first.

In circuit C, the parallel switches 124, 126 and 128 represent different stations for burglary monitoring and any suitable switch means may be used to close the circuit. These may include sensitive mechanical triggering devices which do not require current while monitoring or electrical types such as light beams and the like.

I have also provided a fourth monitoring circuit, D, for monitoring any power failure. While such a failure, if not detected, ultimately will result in an alarm from circuit A, the purpose of circuit D is to produce the alarm immediately upon a power failure. Here the incoming power lines are represented at 130 and 132 and relay 134 across these lines holds switch 136 open as long as power is present. When power is interrupted, relay 134 is de-energized allowing switch 136 to close and actuate the alarm.

With reference again to the sensing devices 104, 112 and 114 in circuit A, I have considerably improved the efficiency of the alarm system for use in monitoring situations where food spoilage is an important concern, and this is accomplished by utilizing my new sensor device, designated generally at 138, which is used in association with the normal sensors 104, 112 or 114 and the like. The general purpose of sensor 138 is to make the alarm actuating sensors 104, 112 or 114 responsive to food temperature as distinguished from air temperature. In the normal operation of refrigerating equipment, heat is absorbed from air moved over a coil and the continual circulation of the chilled or cooled air about food or food packets absorbs heat therefrom until a given temperature is maintained by continual removing of heat leaks from the outside during the operation of the equipment. However, due to the build-up of ice on the coils so as to impair air circulation, modern refrigeration systems shut down for what is known as the defrost cycle to allow time for the ice to melt as is well known. Such defrost cycles may vary from a few minutes to several hours depending upon the circumstances and equipment in each case and the circulating air during such cycle may become warm enough to exceed normal alarm limits while the actual food temperature is still clearly in a safe range relative to danger from spoilage. Consequently, an alarm system for monitoring food temperatures in a refrigeration area must contain some means of differentiating between a defrost cycle and a breakdown so that it will not prematurely go off a normal defrost cycle. For this purpose, in many presently used alarm systems, time delay mechanisms are introduced into the alarm systems which hold off an alarm being given until a defrost cycle has been performed and the refrigeration unit has again begun to function. In this way, the time delay can bridge over a normal defrost cycle without giving a false alarm. It is apparent, however, that each unit connected to an alarm system would have to have a delay time of its own because there are as many defrost cycles as there are case units. A big installation therefore, containing several units, would have many delay timers, each set for its individual case. All time delay devices of this kind

can be eliminated in favor of my new type sensor 138 which disregards defrost cycles entirely.

Since the only reason for an alarm system for monitoring food temperature in a refrigerated area is the fear of a temperature rise where food spoilage occurs and can produce a material loss, it is apparent that an alarm is only needed when food spoilage is threatened. Whether spoilage threatens from a long defrost cycle or a breakdown of equipment makes no difference whatever. When the food temperature in any packet approaches the danger point, an alarm must be given and sensor 138 is designed to carry out these demands for an alarm.

Sensor 138 comprises a core of material 140 whose size or volume is determined by the heat equivalent needed for the application as, for example, a core having the same heat equivalent and warm up characteristics as a packet of frozen food. This core material may be anything that gives a desired result and its purpose is to store or absorb a given quantity of heat. The bi-metallic thermostat element such as 104 or 112 is set into the core material to sense the temperature of the core mass and the contacts on each side of such bi-metallic elements are set to allow both maximum and minimum temperature settings. A thermistor 141 is set into the core 140 and is connected in parallel with the contacts of the limiting bi-metal switch 104 or 112. This permits temperature measurements of the core material at any time and it aids in setting the limit contacts to their proper values. An insulating material 142 encases core 140, bi-metallic strip 104 or 112, and thermistor 141 as a means of controlling the rate of gaining or losing heat stored in the core. Variation in the insulating material and its thickness both serve to change the time constant of the thermal delay probe to match its application.

If moisture becomes a detrimental factor at the contacts, the bi-metallic actuation may be replaced with a bulb and capillary tube 114 arrangement that will actuate contacts remotely from the sensor 138 in a well-known manner.

The sensor 138 described above has equivalent characteristics to a packet of frozen food and would be able to give an alarm when the spoilage temperature is approached. In this manner of sampling actual product temperature, delay mechanisms are eliminated entirely from the alarm system and defrost cycles can be any length desired so long as they do not go past the safe limits for frozen food, because, when the limits are exceeded relative to food temperature, the alarm will be actuated.

The operation of the foregoing alarm system will now be described in relation to the monitoring of a refrigerated area where it is assumed that a temperature rise in a given cooler has caused the contacts relative to the thermostat coil switch 104 to close and make a connection across circuit A. As this occurs, battery current from batteries 78 and 80 flows through switch 144, out on one side 146 of circuit A through contacts of closed thermostat 104 and back on the other side 148 of circuit A to terminal 150.

From this point, the current divides, one part flowing through line 152 and the other part through line 154. The current going to line 152 passes through a silicon rectifier 156, through line 158 and through variable resistance 72 to start charging condenser 76. As condenser 76 becomes charged, its voltage increases and, since the base and emitter of transistor 74 is connected across condenser 76, the increasing voltage between base and emitter allows an increase of current from circuit A to flow through the transistor 74 and relay coil 66. Voltage build-up across condenser 76 continues until the corresponding increase in current through relay coil 66 causes such relay to close. When relay 66 closes, two sets of contacts 160 and 162, connected by element 164, change positions. Contacts 160 are connected across condenser 76 as a means of discharging condenser 76 when they are closed. Variable resistor 70 has been placed in series

with contacts 160 so that the discharge of condenser 76 can be varied from an instantaneous discharge when no resistance is introduced to a slower rate when resistance is included. Resistances 70 and 72 adjust the charge and discharge rate of condenser 76.

After condenser 76 discharges to a point where the voltage across it is lowered, transistor 74 will cause current flow through relay coil 66 and itself to diminish as a result of the reduced voltage across condenser 76 until the relay armature is released opening contacts 160 and again allowing the condenser 76 to receive new charge of current. The process just described will repeat itself or oscillate continuously in this manner until current from batteries 78 and 80 is interrupted by switch 144.

Relay 66, transistor 74, condenser 76, and resistances 70 and 72, as described previously, comprise the pulse generator 64 for the dialing mechanism and an interruptor for the trouble tone oscillators, 84, 86 and 88. This portion of current returns to batteries 78 and 80 by line 166 to the negative pole of battery 80. The pulse generator 66 utilizes the added voltage of batteries 78 and 80.

The second portion of current flowing from circuit A in line 154 runs to transistor tone oscillator 84 and after passing through oscillator 84, returns in line 168 to the negative pole of battery 78 through contacts 162 on relay 66 of the pulse oscillator 64. Contacts 162 act as a means of periodically interrupting the tone oscillator current.

Oscillator 84, as indicated above, includes the transistor 98, two resistors 94 and 96, an output transformer 90, a condenser 92, and two zener diodes 100 and 102. Oscillators 84, 86 and 88 are connected as a Hartley type oscillator and operate in a very stable manner. Condenser 92 tunes the primary of transformer 90 to a desired frequency while the two zener diodes 100 and 102 act as amplitude limiters during oscillation keeping the amount of tone generated at a safe level for telephone usage. These diodes also limit high induced peak voltages from damaging the transistor 98 during telephone dialing.

Thus far described, it will be understood that the closing of circuit A in the cooler by element 104 has actuated the pulse oscillator 64 and the tone oscillator 84. During this phase, each time relay 66 operates, contacts 162 close momentarily and complete a circuit through battery 82, motor 20, and contacts 54. Momentary closure of contacts 162 send a pulse of current to motor 20 and motor 20 responds to this pulse of current by rotating approximately a single turn or more for each pulse. Length of a pulse is varied by adjustment of resistance 70.

As motor 20 receives periodic pulses from the pulse generator 60, cam discs 40 and 42 are slowly advanced an incremental amount with each pulse. At the beginning of the pulses, cams 40 and 42 are in a position where both sets of contacts 52 and 54 are on the inner diameter of their respective cams. In these positions, contacts 52 are open and contacts 54 will be in the position shown in FIG. 5. Arrows 170 and 172 placed on the respective cam discs 40 and 42 indicate the direction of rotation.

Pulses continues to advance cams 40 and 42 to where cam 40 will close contacts 52. A telephone line including leads 174 and 176 connected to terminal block 178, now has its circuit completed through contacts 52 and will obtain dial tone. Closing contacts 52 performs the same function as picking up a telephone from its stand to obtain a dial tone. In both cases, a telephone circuit is completed and it becomes ready to receive dial pulses of a called number.

Cams 40 and 42 keep slowly rotating as pulses are received until contacts 54 are switched to their outer position. At this point, the normally open contacts now close to short out pulsing contacts 162 on pulsing generator 64, and the normally closed contacts open to remove a short across variable resistance 180. The contacts thus closed cause motor 20 to run continuously and its speed is now regulated by adjusting resistance 180. Cams 40 and 42

are now rotating at a speed properly adjusted by resistance 180 so that contacts 52 will make and break in accordance with the number of notches cut in cam 40. These represent the telephone number being called. The proper speed is the make and break rate required by telephone dialing system which is equivalent to ten cycles per second.

After the last number is dialed, contacts 54 again return to the inner cam diameter stopping motor 20. Pulses begin again to move motor 20 and with it cams 40 and 42. Contacts 52 remain closed so the called party will have time to answer the phone and also have enough time to hear the troubled tone from the tone generator 84, and this tone is transmitted over the telephone line until contacts 52 open.

As pulses continue to rotate cam 40 and cam 42, contacts 52 will open as the cam spring follower arm 56 again returns to an inner cam diameter. This releases the telephone line and equipment so it is not tied up for a long time.

Pulses from the pulsing generator 64 keep rotating the dialing mechanism through its cycle of dialing and waiting as long as contacts 104 in the cooler are closed indicating there is a warm up beyond the normal set ting. The advantage of recalls is in case a called line happens to be busy on the first call, subsequent calls will finally be completed to notify the party of impending trouble and this cycle of intermittent dialing of the telephone number will continue until some responsible party has received and answered the alarm and opened the circuit by means of switch 144.

In the cycle just described, it will be appreciated that trouble on circuit A will always send tone from generator 84 which, for example, may be approximately 200 cycles per second. In this manner a called party will always know when he hears a 200 cycle tone that the trouble is on circuit A. In a similar manner for example, should the heat fusible switches 118, 120 or 122 in circuit B be actuated, tone generator 86 would be energized putting a tone on the line which may be 500 to 600 cycles per second. Frequency separation between each tone generator is sufficient for easy identification by the called party. And, again in circuit C, still another tone would be furnished by tone generator 88. Circuit C may be connected with burglar sensitive switches or other equally important functions.

It should be pointed out that the means of selecting the proper tone generator while, in each instance, using the same pulse generator or switches, is accomplished without the use of relays. Instead, separation of the tone generators is achieved through the use of diode units 156, 156b and 156c. Circuits A, B, and C all furnish current to pulse generator 64 through a diode unit. Each diode unit acts as an isolation device for its respective tone generator by preventing current from one line in use from backing into all other generators.

With reference to the method of changing speeds of the mechanical dialing mechanism, it is pointed out that by using an electronic pulse system for very slow speeds, the mechanical dial mechanism is electrically shifted from high to very low speed without the complication of gear shifts, etc. This electrical method of shifting speeds is highly efficient and more dependable than mechanical mechanisms.

A resistance-condenser combination 182 across contacts 52 is used to provide a dialing filter to protect dialing contacts 52.

The sequence of operation for circuit A, as described, is the same for circuits B and C, with circuits B and C being associated respectively with tone generators 86 and 88 as referred to above. Consequently like elements and parts in circuits B and C relative to those described for circuit A are given like numerals followed respectively by the letters "b" or "c".

It will be appreciated from the foregoing that this alarm

system is relatively simple and will permit additional categories to be added at any time without any complications to the basic unit. It is also pointed out that while the trouble tone oscillators 84, 86 and 88 have been shown as simple sine wave generators, many modified well-known types could be substituted if a particular situation demanded the use of such a modification. Such a situation, for example, may suggest a frequency modulated tone generator to sound like a siren, or a special multi-vibrator type of oscillator for a special function, or a flashing light to attract attention during hours when working personnel are present. In addition, a suitable switch means may be employed to transfer the alarm signal from telephone dialing to a local on-the-premise signal, if desired.

Pulse generator 64 is, as should be apparent, an oscillating circuit including a switching means provided by the coil 66, the core 164, and the contacts 160 and 162. Such switching means forms an integral part of the oscillating circuit and is oscillatable therewith. By virtue of the oscillation of such switching means, and in particular the "make and break" with contacts 162, the motor 20 is alternately connected with power supply 82 and disconnected therefrom so long as switching means 54 is in the position shown in FIG. 5.

I claim:

1. In a telephone dialing system adapted to automatically dial a telephone number, the combination of:

- (a) switching means adapted to be connected across a telephone line to transmit information thereto;
- (b) drivable switch operating means for opening and closing said switching means to simulate the dialing of a telephone number and for maintaining said switching means closed for a given interval of time preceding a simulated dialing;
- (c) electrical motor means for driving said switch operating means;
- (d) electrical means for energizing said motor at a first speed and a second faster speed; and,
- (e) control means for selectively operating said electrical means whereby said switch operating means is driven at a faster speed during a simulated dialing than during said given interval.

2. The combination defined in claim 1 wherein said electrical means includes a power supply, a first control switching means for connecting said electrical motor with said power supply, an oscillating circuit for opening and closing said first control switching means whereby drive pulses are fed from said power supply to said motor means for energization thereof at said first speed and a second control switching means for connecting said motor means with said power supply free of the influence of said first control switching means for energization of said motor means at said second speed.

3. The combination defined in claim 2 wherein said control means comprises cam means driven by said motor.

4. In a telephone dialing system adapted to automatically dial a telephone number, the combination of:

- (a) first switch means adapted to be connected across a telephone line;
- (b) an electrical motor;
- (c) first switch operating means driven by said motor for opening and closing said first switch means to simulate the dialing of a telephone number and for maintaining said switching means closed for a given interval of time preceding a simulated dialing;
- (d) a power supply;
- (e) an activatable oscillating circuit including a second switch means therein and oscillatable therewith;
- (f) third switch means for selectively connecting said electrical motor with said power supply for continuous feed of current to said motor and alternatively for connecting said motor with said power supply through said second switching means for intermittent feed of current to said motor; and,

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(g) second switch operating means driven by said motor for operating said third switching means to connect said motor to said power supply through said second switch means during said interval, and for thereafter connecting said motor with said power supply for continuous current feed.

5. The combination defined in claim 4 wherein said first and second switch operating means comprise cam members, and wherein said second switch operating means is timed with respect to said first switch operating means to also connect said motor to said power supply through said second switch means immediately following a simulated dialing.

6. The combination defined in claim 4 wherein said oscillating circuit includes an electronic valve, circuit means including a capacitor means for rendering said valve conductive, and a coil connected with said valve to receive an output therefrom, said coil forming the drive of said second switching means, said second switching means having contacts coupled across said capacitor to discharge said capacitor when said coil receives an output from said valve.

7. The combination defined in claim 6 wherein said circuit means includes a power supply, and means connecting said capacitor to the last-mentioned power supply including means for adjusting the charge time of said capacitor.

8. In a telephone dialing system adapted to automatically dial a telephone number and report an alarm condition, the combination of:

(a) first switch means adapted to be connected across a telephone line;

(b) an electrical motor;

(c) first switch operating means driven by said motor for opening and closing said first switch means to simulate the dialing of a telephone number and for maintaining said switching means closed for a given interval of time preceding a simulated dialing;

(d) a power supply;

(e) an activatable oscillating circuit including a second switch means therein and oscillatable therewith;

(f) sensor means responsive to an alarm condition for activating said oscillating circuit;

(g) third switch means for selectively connecting said electrical motor with said power supply for continuous feed of current to said motor and alternatively for connecting said motor with said power supply through said second switch means for intermittent feed of current to said motor; and,

(h) second switch operating means driven by said motor for operating said third switch means to connect said motor to said power supply through said second switch means during said interval, and for thereafter connecting said motor with said power supply for continuous current feed.

9. The combination defined in claim 8 wherein said oscillating circuit includes an auxiliary power supply, and wherein said sensor means comprises a switching means responsive to a predetermined alarm condition to connect said oscillating circuit with said auxiliary power supply.

10. The combination defined in claim 9 wherein said oscillating circuit further includes an electronic valve, circuit means including a capacitor means for rendering said valve conductive, and a coil connected with said valve to receive an output therefrom, said coil forming the drive of said second switching means, said second switching means having contacts coupled across said capacitor to discharge said capacitor when said coil receives an output from said valve, and wherein said sensor means connects said capacitor with said auxiliary power supply in response to said predetermined alarm condition.

11. The combination defined in claim 10 and further including activatable tone generating means, said tone generating means being coupled to said oscillating circuit for activation thereby, said first switching means being cou-

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pled to said tone generating means for supplying said tone to said line.

12. The combination defined in claim 11 wherein said tone generating means comprises a transistor oscillator circuit.

13. The combination defined in claim 8 and further including activatable information signal means connected with said oscillating circuit for activation thereby and connected through said first switch means with said telephone line.

14. The combination defined in claim 8 and further including at least one more sensor means responsive to another alarm condition, and at least two activatable tone signal generating means operating at different frequencies, each of said sensor means being connected with said oscillating circuit to activate the same, said sensor means being also connected respectively to different of said tone signal generating means to activate one of said tone generating means in response to one of said alarm conditions, said tone signal generating means being each connected through said first switch means with said telephone line.

15. The combination defined in claim 14 wherein said tone generator means are connected to said oscillating circuit through said second switch means for intermittent activation, and wherein the connection of said tone generator means through said first switch means includes a transformer.

16. The combination defined in claim 8 wherein said sensor means comprises a bi-metallic switching means, a thermistor connected in parallel thereacross, a core casing enclosing said bi-metallic switching means and said thermistor, said core casing being an electrically insulated material having predetermined heat capacity characteristics closely similar to those of a refrigerated item and an outer casing enclosing said core casing and having predetermined heat conductivity.

17. In an automatic dialing telephone system adapted to automatically dial a given telephone number in response to an alarm condition, and to indicate the alarm condition when the number is answered, the combination of activatable pulse generator means for generating a series of electrical pulses, sensor means for sensing a predetermined condition and activating said pulse generator means, automatic telephone dialing means including a drive motor, first switching means, control means driven by said motor for operating said first switching means to simulate telephone dialing, means for producing an information signal in response to operation of said pulse generator means, a power supply coupled to said drive motor, first circuit means responsive to said electrical pulses for intermittently coupling said power supply to said motor to drive the same at a first rate, second switching means operated by said control means for connecting said drive motor with said power supply means and rendering said first circuit means ineffective, and second circuit means coupling said means for producing an information signal with said first switching means for connection with a telephone line.

18. A drive system cyclically operable at varying speeds, said system comprising a motor, cam means driven by said motor, a power supply, generator means for producing a series of electrical pulses, and first and second switching means, said first switching means having at least two positions and cooperating with said cam means for movement from one of said positions to the other of said positions in response to movement of said cam means, said second switching means being responsive to said electrical pulses to intermittently couple said motor with said power supply in one position of said first switch means for drive of said motor at a first speed, said first switching means coupling said power supply with said motor for continuous drive of said motor at a second speed greater than said first speed, whereby said motor is driven cyclically at said first and second speeds.

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19. A drive system as defined in claim 18 wherein said generator means includes said second switching means as an integral part thereof, and wherein operation of said second switching means changes the operating condition of said generator means.

20. A sensor means for use in a refrigeration system storing packaged refrigerated items of prescribed type, said sensor means comprising a bi-metallic switching means, a thermistor connected in parallel relation thereacross, a core casing enclosing said bi-metallic switching

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means and said thermistor, said core casing being an electrically insulated material having predetermined heat capacity characteristics closely similar to those of said refrigerated item and an outer casing enclosing said core casing and having predetermined heat conductivity.

No references cited.

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