

Dec. 22, 1936.

F. G. KELLY

2,064,980

DETECTING SYSTEM

Filed May 15, 1935

2 Sheets-Sheet 1

Fig. 1

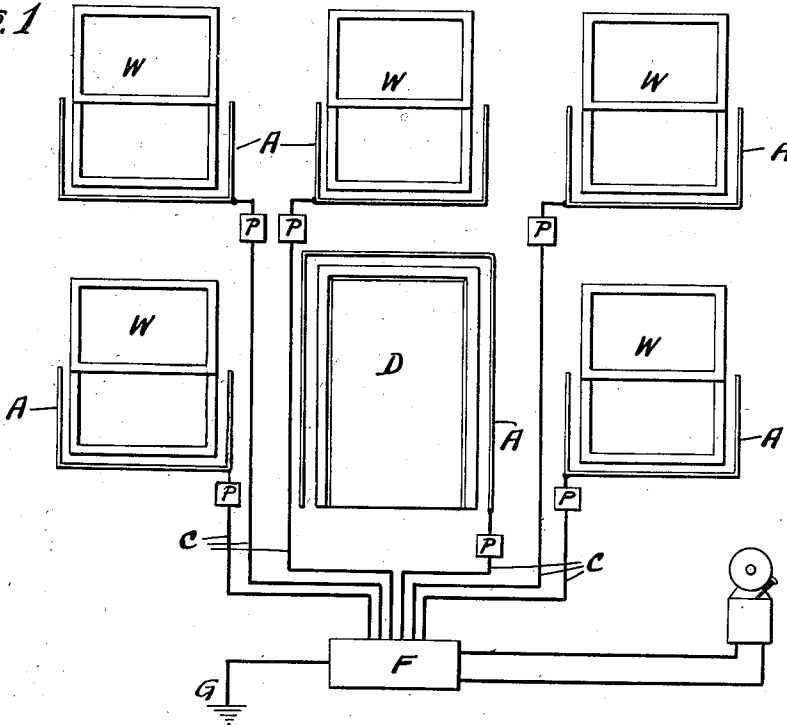
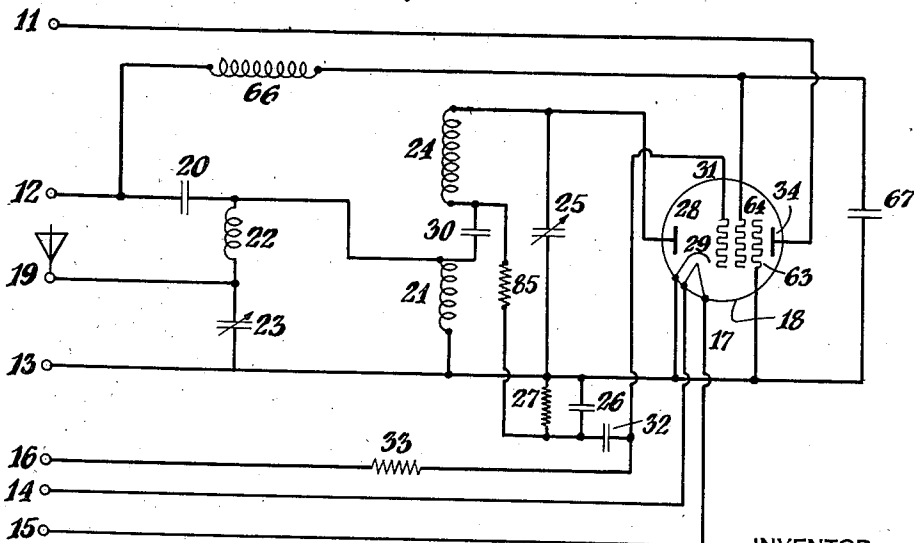


Fig. 2



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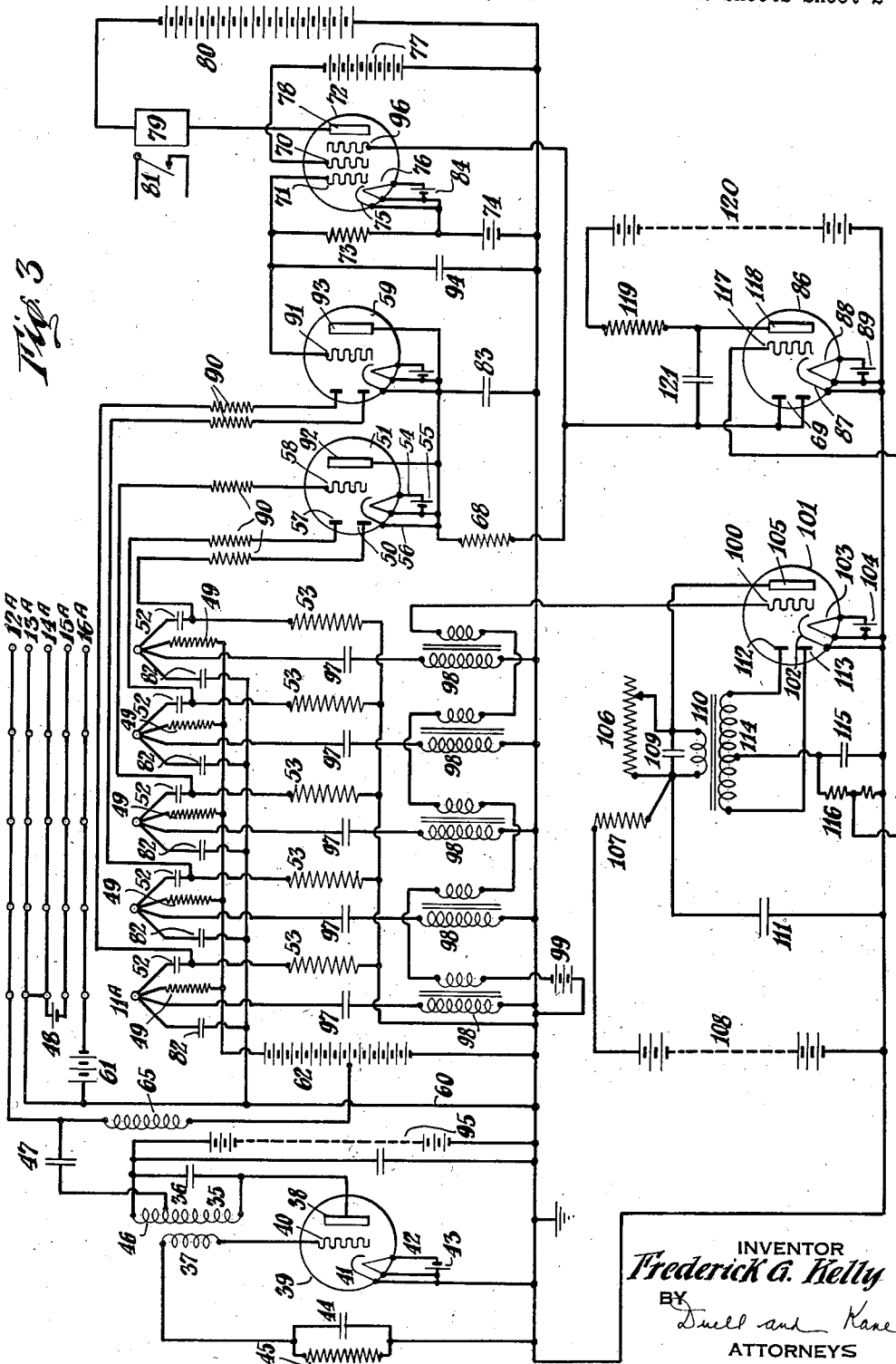
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2 Sheets-Sheet 2

Fig. 3



UNITED STATES PATENT OFFICE

2,064,980

DETECTING SYSTEM

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11 Claims. (Cl. 177-314)

This invention relates to a structurally and functionally improved detecting system intended for use in connection with buildings and other enclosures for the purpose of safeguarding the same.

It is an object of the invention to furnish an apparatus of this nature and which would depend upon an electrically charged system for its operation; such system and the individual components thereof reacting in an improved manner to actuate an alarm in the event that the capacity of such components is disturbed as would be the case if an intruder sought to effect entry to the premises safeguarded by this system.

A further object of the invention is that of furnishing a system of this nature and which will not react to otherwise actuate an alarm when such actuation should not occur. In other words, the system will not be responsive to impulses of a nature such that they could not be caused by a human body or agency seeking to effect entry to the premises.

A still further object is that of providing a system embodying the foregoing invention and which system will also not be responsive to capacity changes such as would normally occur incident to fluctuations in temperature, the relative humidity of the air, etc.

As a consequence a system constructed according to the teachings of the present invention will be substantially incapable of giving a "false alarm" and, consequently, when the system does function a person will know that he may place reasonable dependence on the fact that an intruder, or an appliance wielded by an intruder is seeking to enter or has actually effected entry on the premises which are being safeguarded.

An additional object of the invention is that of furnishing an apparatus of this nature which will embody relatively few parts, each individually simple and inexpensive in construction, these parts operating over long periods of time with freedom from difficulties or the need of replacement and the detecting portions of the system being of such a nature that they are practically invisible or at least very inconspicuous. Moreover, the components of the present system will not lend themselves to being readily tampered with. As a consequence of which even a person having knowledge of the system will be at a loss to render the system inoperative so that safeguarded premises would be

capable of being entered without an alarm being given.

With these and other objects in mind, reference is had to the attached sheets of drawings illustrating one practical embodiment of the invention and in which:

Fig. 1 shows schematically a layout for an alarm system;

Fig. 2 is a diagrammatic view of the wiring and apparatus which forms a part of one unit of the system; and

Fig. 3 is a similar view showing a further unit which is employed in conjunction with the unit illustrated in Fig. 2.

As afore brought out, the invention is primarily intended to be employed in connection with the detecting of unauthorized entrance, and in the following specification and drawings the description has been accordingly limited. It will, however, be appreciated that the invention might be employed for the detection of any desired electrical capacitance variations, whether these be caused by foreign bodies entering the field of the system, moisture variations, temperature variations, etc. Accordingly, this description is to be taken merely in an illustrative sense except where the appended claims would indicate that a more specific interpretation is in order.

With the foregoing in mind, Fig. 1 shows a schematic layout of the system, and in this figure the windows are designated by "W" and a door by "D". All of these openings are to be protected so that an intruder will be detected and cause an alarm to be sounded. "A" indicates the antenna which may consist of a wire arranged near the windows and the door as shown. The antennas are grouped in sections and each section is connected to a partial detecting and amplifying unit P. For the sake of brevity this device will hereinafter be called a "packet." Each packet is connected by an inter-connecting cable C to the main detecting and amplifying device F. For the sake of brevity, this device will be called the "central set." The central set has a ground connection "G" and is also connected to the alarm which may be a bell, as shown, or floodlights, or any other device that will serve as an alarm.

Figure 2 shows the details of a packet. This particular one is designed to carry an antenna not exceeding 200 m. m. f. capacity to ground. The connecting cable between the packet and the central set has six conductors in it and connects to terminals 11 through 16 inclusive

Referring to Fig. 3 which shows the details of the central set, there are shown terminals 11A through 16A inclusive, arranged in vertical rows of six. Each vertical row connects to the connecting cable from a packet, the wires in the cable being arranged so that the terminal 11 in the packet connects to terminal 11A in the central set, 12 to 12A, etc. There will be one such vertical row for each packet, the number of rows being determined by the number of packets.

Terminals 13A connect through wire 60 to ground. An oscillator in the central set supplies five volts at 200,000 cycles between terminals 12A and ground. The details of the oscillator will be described later. Terminals 14A and 15A connect to battery 48 which supplies current for heating the filaments of the vacuum tubes in the packets. One side of the filament supply is grounded. Terminals 16A are connected to battery 61 of minus three volts, the plus side of battery 61 being grounded. As will be noticed from Fig. 3, all the like numbered terminals of all packets are connected in parallel at the central set with the exception of terminal 11, which connects to a separate terminal 11A, one for each packet. Each terminal 11A connects through a resistance 49 of 35,000 ohms to the plus side of battery 62 of 100 volts, the negative side of the battery being grounded.

Referring again to Figure 2, it will be noted that the oscillator output from the central set is supplied across a circuit including a condenser 20 of 500 m. m. f. capacity, inductance 22 of 3.75 m. h. and variable condenser 23 of 200 m. m. f. capacity. The antenna is connected to terminal 19, and consequently the antenna capacity may be considered as a condenser in parallel with condenser 23.

It is apparent that there is a point of resonance in the above circuit when the capacity of the antenna and condenser 23 are such that their reactance equals the reactance of inductance 22. This occurs when the combined capacity of antenna and condenser 23 is approximately 170 m. m. f. At that point the voltage across the portion of the circuit in resonance will be substantially zero, neglecting the resistance of inductance 22, which is low. As the combined capacity is increased, the voltage across the above mentioned portion of the circuit will gradually rise and it will be found that between a capacity of 180 m. m. f. and 220 m. m. f. the curve will approximate a straight line. Above 220 m. m. f. the voltage increases at an increasing rate.

The above described voltage is connected to an auto-transformer whose winding is 21 and 24. Condenser 30 of .001 m. f. capacity serves merely as a by-pass for the radio frequency current and is practically equivalent to a connection between the coils. The coils are as closely coupled as possible to attain the equivalence of a single coil. Transformer 21 and 24 is a tuned transformer, being tuned by variable condenser 25. It has a 1:7 step-up ratio, this high ratio and efficiency being possible because it is tuned to the frequency of the voltage it must amplify. The terminal of the transformer common to input and output is connected to ground conductor 13. The tap for input is the connection between coil 21 and condenser 30. The high voltage end of the transformer is connected to anode 28 of vacuum tube 18. Direct current resulting from rectification of the radio frequency output of the transformer by the vacuum tube elements is led from coil 24 by resistance

85 of 100,000 ohms to a filter and bias consisting of condenser 26 of .00025 m. f. capacity and resistance 27 of 6 megohms. Condenser 30 is used to prevent these direct components flowing to ground through coil 21. Whenever the voltage swings positive, anode 28 will draw electrons from cathode 29, the heater being designated by 17. In this way condenser 26 will be kept charged at a negative potential almost equal to the peak of the alternations. A small part of the charge will leak off through resistance 27 and consequently the potential of condenser 26 never quite reaches the peak value of the alternations. If the voltage on the transformer changes, the potential of condenser 26 will follow and adjust itself to the new peak almost instantly.

The negative side of condenser 26 is connected to the grid 31 through coupling condenser 32 of 4 m. f. capacity. Grid 31 is also connected to terminal 16 through resistance 33 of 3 megohms. Terminal 16 supplies minus 3 volts bias. When equilibrium is reached, grid 31 will be at minus 3 volts, the difference between its bias and the potential of condenser 26 appearing as a potential across condenser 32.

The suppressor grid of tube 18 is indicated by 63 and is connected to ground. The screen grid is marked 64 and receives a potential of plus 50 volts from battery 62 (Fig. 3). The same wire that supplies the high frequency current to the packet also supplies the plus 50 volts. This is accomplished by inserting chokes 65 and 66 in the 50 volt circuit which keeps out the high frequency current. Similarly, condensers 47 and 20 prevent the 50 volt direct current from getting into the oscillator or the resonator circuit. Condenser 67 of .1 m. f. capacity acts as a shunt for radio frequency currents, so that the potential of screen grid 64 will not fluctuate.

Referring to Figure 3, it will be noted that terminal 11A is connected through condenser 52 of 4 m. f. capacity and resistance 90 of 3 megohms to anode 50 of vacuum tube 51. This vacuum tube serves merely as a coupling device. It has a cathode 56 and filament 54, the filament being heated by battery 55. One side of the filament is connected to the cathode. Branching off from the junction of condenser 52 and resistance 90 is resistor 53 of 3 megohms which connects to ground.

The second plate terminal connects through a similar condenser 52 and resistance 90 to a second anode 57. Similarly the third plate terminal connects to the grid 58 which serves as a third anode. The number of packets connected to one coupling tube is limited only by the number of anodes built in commercial vacuum tubes. As illustrated, this number at present practice is 3. A second group of packets can be used by providing a second coupling tube 59, etc. A grid 91 of the last tube serves a special purpose and cannot be used as an anode. Accordingly the number of packets that can be connected with one, two, or three tubes is two, five, or eight respectively. The cathodes of all coupler tubes are connected together. Plates 92 and 93, which are not used, should be connected to the cathodes. Condensers 82 of .01 m. f. capacity and condenser 83 of .1 m. f. capacity act as bypass circuits for any stray alternating currents.

Grid 91 connects to grid 71 of vacuum tube 72. It also connects to the cathode through resistance 73 of 6 megohms and to ground of condenser 94, .1 m. f. capacity. The filament 76 of vacuum tube 72 is heated by battery 84, one side of said filament being connected to cathode

75. The cathode has a 3 volt positive bias by means of battery 74. Screen grid 70 is supplied with voltage by battery 77, the minus side of battery 77 being grounded. Plate 78 connects to relay 79 and battery 80. The minus side of battery 80 is grounded. When relay 79 operates it closes contacts 81 which may be used to control flood lights, bells, or any other desired alarm device.

10 The cathodes of all coupler tubes also connect through resistance 68 of 3 megohms to anodes 69 of vacuum tube 86. This vacuum tube has a grounded cathode 87 and a filament 88. Filament 88 is heated by battery 89. The anodes also connect to the suppressor grid 96 of vacuum tube 72.

The oscillator which supplies the 200,000 cycle supply to the packets is shown in Fig. 3. The oscillator coil 35 has an inductance of 126.5 micro-henries, and the oscillator condenser 36 has a capacity of .005 m. f. The feed back coil is marked 37. One side of the oscillator tank circuit is connected to the positive terminal of a 90 volt battery 95, the other side to the plate 38 of vacuum tube 39. The feed back coil is connected to the grid 40. The cathode 41 is grounded and the heater element 42 is heated by battery 43. Feed back coil 37 is connected to ground through a parallel circuit consisting of condenser 44 of .001 m. f. capacity and resistance 45 of 50,000 ohms. This parallel circuit acts as an automatic bias for grid 40. The output is tapped off from point 46 and is connected through condenser 47 of .5 m. f. capacity to terminals 12A.

It will now be possible to describe the complete sequence of operations of the system, which is as follows:

As long as the combined capacity of the antenna and condenser 23 is between 180 and 220 m. m. f. the change in voltage produced by a fixed change in capacity, such as caused by the approach of an intruder, will be substantially the same. Condenser 23 is set so that the combined capacity of antenna and condenser 23 equals 200 m. m. f. Then the antenna capacity may vary plus or minus 20 m. m. f. and the change in voltage produced by the approach of an intruder will be the same. In other words, the gradual and seasonal variations may be as great as plus or minus 20 m. m. f. without affecting the sensitivity of the system by shifting the system out of its normal working range. In most applications a practical antenna can be built with such limits and accordingly no greater variations need be provided for although any other limits can be obtained by choosing the proper circuit constants.

If an intruder approaches the antenna, causing an increase in antenna capacity, the voltage supplied to transformers 21 and 24 will increase, causing an increase in the negative potential of condenser 26. The charge on condenser 32 cannot change instantly since it must come through resistance 33 and consequently the potential of grid 31 is made more negative. This results in a decrease in the plate current of vacuum tube 18, the plate current being from battery 62, resistance 49, terminals 11A and 11, plate 34, and cathode 29 to ground.

As soon as the transient condition in the antenna circuit has ceased, condenser 32 will be charged through resistance 33 and eventually grid 31 will again reach a bias of minus 3 volts

and the original plate current will be reestablished.

When the central set is in equilibrium, all anodes of the coupler tubes will be at ground potential, the difference between ground and the potential of terminal 11A appearing as a potential across condenser 52. Cathode 56 is also at ground potential because rectifier anode 69 cannot swing positive and cathode 56 cannot of itself swing positive. Since cathode 56 is at ground potential grid 91 will also be held at ground potential which will prevent grid 71 rising more positive than ground potential. The difference between the positive bias of cathode 75 and the potential of grid 71 will appear as a resistance drop across resistor 73. Since grid 71 is negative with respect to cathode 75, the plate current of tube 72 will be small. By having relay 79 of proper value, this current will not be enough to pull the relay in.

When an intruder approaches an antenna, the plate current of the affected packet decreases causing a rise in the potential of terminal 11A connected to that packet. In other words, the approach of the intruder toward the antenna causes a decrease of the packet plate current and the potential across resistance 49 will decrease. Since the potential of one end of the resistor is fixed by battery 62 the potential of the other end of the resistor must rise. This rise is with respect to the ground. The potential of condenser 52 cannot change instantly because any change must come through resistance 53 and consequently the potential of the anode rises. Cathode 56 will follow this potential, the difference between it and rectifier anode 69 appearing as a drop across resistance 68. The rise in potential of cathode 56 unlocks grid 91 and permits grid 71 to rise to the potential of cathode 75. This takes a short period of time because condenser 94 has to be charged through resistance 73. The rise in potential of grid 71 causes an increase in the plate current of tube 72 and if the change is sufficient relay 79 will pull-in closing contacts 81 and sounding the alarm. In the meantime normal conditions have been re-establishing themselves at a definite rate and eventually grid 71 will again be at ground potential causing the plate current to drop and relay 79 to drop out. This will open contacts 81 and stop the alarm.

The above describes the complete sequence of functions resulting from the approach of a body towards the antenna. It will be noted that the change in capacity must be at least a certain amount in order to cause a sufficient increase in the plate current of tube 72 so that it will operate relay 79. Furthermore, any change must occur above a certain minimum rate of m. m. f. per second because the circuit has restoring actions for grids 31 and 71, (and coupler anodes) proportional to their displacements from steady-state potentials. If the change in antenna capacity is at a low rate the potentials of grids 31 and 71 will not change sufficiently to cause the output relay—hence the alarm—to work. It therefore becomes apparent how the slow seasonal variations in antenna capacity are distinguished from the relatively more rapid changes produced by the approach of a body.

Now suppose that the various packets connected to the central set are receiving interference impulses as described above. The resultant fluctuation in each section is only a portion of the larger total that would have occurred

if all sections had been connected together. The corresponding fluctuations of coupling anodes 50, 57, 58, etc. tend to raise the potential of grid 71. However, due to unidirectional conductivity of the electron streams commandable by each coupler anode, only the most positive anode passes any current through the coupler and consequently the potential of cathode 56 has to follow the most positive anode, all other anodes being at an insufficient positive voltage above the cathode for conduction. Hence, the largest interference impulse received on any one packet is the size of the interference impulse received by the entire system. The capacity interferences are similar to the changes produced by an intruder except that, in general, their intensity per foot of antenna length is very much smaller than the effect of an intruder, who, at most, affects one or two feet of antenna. However, if the antenna is long enough, the sum total of the capacity impulses on one antenna may be great enough to cause an alarm. Accordingly, in practice the sections are preferably made small enough so that the largest impulse apt to be received will not be large enough to cause an alarm. Naturally, the sensitivity of the system to an intruder is not affected because the sensitivity along the entire length of the antenna is independent of its length.

30 The above describes the operation of the system during the approach of an intruder towards the antenna. It also describes the way in which seasonal variations and their distributing factors are taken care of. The disturbance due to contacting at joints in metal work, etc., may, sometimes, not be adequately taken care of by subdivision of the antenna. Often a coupling to a source of trouble is confined to only a few feet of one section of antenna. The invention contemplates other means of overcoming this difficulty. All of these changes referred to have one thing in common, namely, the change in capacity occurs substantially instantly or at least at a very high rate. The invention provides a system which will not respond to capacity changes, however large, if the rate is greater than the maximum rate that an intruder is liable to produce. The way in which this is accomplished will now be described.

50 Each terminal 11A connects to a condenser 97 of .2 m. f. capacity and to the primary of a 4:1 audio transformer 98. The secondaries of these transformers are connected in series. One end of the secondaries is connected to a minus 3 volt battery 99, the plus side of the battery being grounded. The other end of the secondaries connects to grid 100 of vacuum tube 101. This vacuum tube has a cathode 102 which is grounded and a filament 103 which is heated by battery 104. The plate circuit connects from plate 105 to variable resistance 106 of 15,000 ohms, and battery 108 of 105 volts, the minus side of the battery being grounded. In parallel with resistance 106 is condenser 109 of .01 m. f. capacity and also the primary of a 1:4 audio transformer 110. The secondary of transformer 110 connects to diodes 112 and 113 of vacuum tube 101. The secondary has a center tap 114 which connects to condenser 115 of .01 m. f. capacity and also to resistance 116 of 4 megohms. Condenser 115 and resistance 116 also connect to ground. The center of resistance 116 connects to grid 117 of vacuum tube 86. The plate circuit of vacuum tube 86 connects from plate 118 to resistance 119 of 15,000 ohms and

battery 120 of 100 volts, the minus side of battery 120 being grounded. Condenser 121 of 4 m. f. capacity connects from plate 118 to diodes 69.

Assuming now that a capacity change occurs at an antenna and at a very high rate, the potential of terminal 11A of the affected packet will rise abruptly. The constants of the packet circuits are chosen so that this high wave front will be immediately transmitted to the central set. The values of condenser 97 and transformer 98 are so chosen that an abrupt rise of potential of terminal 11A will cause a heavy transient in the condenser and transformer circuit, whereas a less steep wave front will be very much attenuated. The transient induced in the secondary will cause a transient in the grid potential of tube 101 and result in a similar but amplified transient in the plate circuit of tube 101. The plate circuit in turn induces a larger transient in the secondary of transformer 110. Diodes 112 and 113 will cause condenser 115 to be charged to approximately the peak value of the transient. As a result, grid 117 of tube 86 will assume a negative potential of one half of this peak.

The drop in potential of grid 117 causes a drop in the plate current of tube 86 resulting in a rise in potential of the plate. Rectifier anode 69 cannot swing positive and condenser 121 will be charged to the difference in potential of diode 69 and plate 118. This charging cannot occur instantly because of the comparatively large size of condenser 121. The duration of the transient in transformer 98 is far too short to allow time for charging condenser 121 and also too weak. Tube 101 serves to amplify the transient and the net work between plate 105 and grid 117 to lengthen its time period. When the transient is over the potential of plate 118 will drop and cause a drop in the potential of rectifier anode 69. This will cause a drop in potential of cathode 56 of the coupler tubes neutralizing the effect of the anode which has been tending to draw the cathode up to its potential and thus prevent the unlocking of grid 91. This in turn, of course, prevents an alarm from being sounded. The entire operation occurs in a shorter time than is necessary for grid 71 to reach the potential of cathode 75, because the time delay in discharging condenser 94 through resistance 73 is much greater than the charging period of condenser 121 before the anodes 69 go negative. Eventually the charge on condenser 121 leaks off and normal conditions will be reestablished.

If the abrupt capacity change is extremely large the neutralizing effect on cathode 56 may be insufficient. Consequently the suppressor grid 96 of vacuum tube 72 is also connected to rectifier anode 69 and will cause a cut-off of the plate current if the drop in its potential is sufficient.

It will thus appear that the system provides for detection of capacity changes occurring at or about the rate which an intruder will cause. Changes occurring at a less or greater rate will not cause alarms.

Changes in sensitivity of a particular packet may be accomplished by changing the size of resistance 49. Decreasing the size of the resistor decreases the sensitivity because the change in voltage drop for the same change in current will be less. Accordingly the rise in the potential of anode 50 will be less. Accord-

ingly, the sensitivity may be increased by increasing the size of the resistance.

The packet shown in Fig. 2 will carry an antenna of a capacity not exceeding 200 m. m. f. If an antenna of larger capacity is to be carried on one packet, the constants of the resonating circuit are changed. For example, if an antenna of 400 m. m. f. is to be carried on one packet, condenser 20 would be changed to .001 m. m. f., and inductance 22 to 1.87 m. h. Condenser 23 need not be changed because its only function is to supply the difference in capacity between the packet capacity of 400 m. m. f. and the antenna capacity.

Referring to Fig. 2, antenna capacity variations produce changes in the D. C. voltage across condenser 26. This voltage, being rectified radio frequency power, is directly proportional to the oscillator voltage, and hence to the voltage of the oscillator plate supply battery—all other conditions remaining constant. Hence, if that battery's voltage should change, a change would occur across condenser 26, which, if rapid and large enough, would cause an alarm just the same as a capacity change. Consequently, while all batteries shown may be replaced if desired with alternating current rectifiers, the rectifier replacing the oscillator supply battery must be very accurately regulated.

From the foregoing it will be seen that a system is provided which, among others, achieves the objects specifically set forth at the beginning of this specification. The division of the system into packets permits the system to be made large or small by simply adding or taking away packets. There is no loss from long interconnections of antenna because the connections from packets to the central set introduce no loss. The sensitivity of individual packets may be separately adjusted to suit the particular openings they may protect. Disturbances that may occur in one or more of the antennas are not cumulative and consequently most of them are reduced to such low intensity that they do not cause false actuations of the alarm. The system adjusts itself to the seasonal weather and other variations which cause changes in capacity. The system is so arranged that other disturbances which may be concentrated over a very small portion of one antenna but which occur at a rate greater than that produced by an intruder will not cause actuation of the alarm.

It is apparent that numerous changes in construction and rearrangement of the parts might be resorted to without departing from the spirit of the invention as defined by the claims, and that moreover the method of detection as herein taught might be varied in numerous different respects.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A device for detecting capacity changes including, in combination, means for providing a constant frequency electrical supply, a circuit including an antenna connected to and energized by said means, means to indicate rate of change of voltage across a portion of said circuit, and means to render said last mentioned means unresponsive to changes in voltage occurring at and above a predetermined rate.

2. A device for detecting capacity changes including, in combination, means for providing a constant frequency electrical supply, a circuit including an antenna connected to and energized by said means, distribution of the total

voltage across said circuit being dependent upon the impedances of each portion, means to indicate rate of change of voltage across a portion of said circuit, and means to render said last mentioned means unresponsive to changes in voltage occurring at and above a predetermined rate.

3. A device for detecting capacity changes including, in combination, means for providing a constant frequency electrical supply, a circuit including an antenna connected to and energized by said means, distribution of the total voltage across said circuit being dependent upon the impedances of each portion, the impedance of one portion varying with changes in antenna capacity, means to indicate rate of change of voltage across a portion of said circuit, and means to render said last mentioned means unresponsive to changes in voltage occurring at and above a predetermined rate.

4. A device for detecting capacity changes including, in combination, means for providing a constant frequency electrical supply, a circuit including an antenna connected to and energized by said means, the voltage across a portion of said circuit varying with changes in antenna capacity, means connected to said circuit adapted to indicate voltage changes occurring at and above a predetermined rate, and means to render said indicating means unresponsive to voltage changes occurring at and above a predetermined rate greater than said last mentioned predetermined rate.

5. A device for detecting capacity changes including, in combination, means for providing a constant frequency electrical supply, a circuit including an antenna connected to and energized by said means, the voltage across a portion of said circuit varying with changes in antenna capacity, means to amplify and rectify the voltage across a portion of said circuit, means adapted to indicate changes in said rectified voltage occurring at and above a predetermined rate, and means to render said indicating means unresponsive to voltage changes occurring at and above a predetermined rate greater than said last mentioned predetermined rate.

6. A device for detecting capacity changes including, in combination, means for providing a constant frequency electrical supply, a circuit including an antenna connected to and energized by said means, the voltage across a portion of said circuit varying with changes in antenna capacity, means to amplify and rectify the voltage across a portion of said circuit, said amplifying means having a relatively poor amplification characteristic for slow rates of change and a good amplification characteristic for rapid rates of change, means for indicating certain of such changes, and means for rendering said indicating means unresponsive to voltage changes occurring at and above a predetermined rate.

7. A device for detecting capacity changes including, in combination, means for providing a constant frequency electrical supply, a plurality of circuits connected to and energized by said means, each said circuit including an antenna, the voltage across a portion of each circuit varying with changes in capacity of the antenna included in that circuit, means connected to all said circuits to indicate such voltage changes, and further means connected to each said circuit and the indicating means to render said indicating means unresponsive to voltage changes occurring at and above a predetermined rate.

8. A device for detecting capacity changes including, in combination, means for providing a constant frequency electrical supply, a plurality of circuits connected to and energized by said means, each said circuit including an antenna, the voltage across a portion of each circuit varying with changes in capacity of the antenna, indicating means connected to said circuits and adapted to be operated by voltage changes in any circuit occurring at and above a predetermined rate, and means connected to each circuit and said indicating means to render said indicating means unresponsive to voltage changes occurring at and above a predetermined rate greater than said first mentioned predetermined rate.

9. A device for detecting capacity changes including, in combination, means for providing a constant frequency electrical supply, a plurality of circuits connected to and energized by said means, each said circuit including an antenna, the voltage across a portion of each circuit varying with changes in capacity of the antenna, means connected to each said circuit and adapted to amplify said voltage changes, further means connected to said last mentioned means adapted to indicate voltage changes in any circuit occurring at and above a predetermined rate, and means connected to each circuit and

said indicating means to render said indicating means unresponsive to voltage changes occurring at and above a predetermined rate greater than said first mentioned predetermined rate.

10. A detecting system including a normally inoperative signalling means, means whereby such signalling may be actuated, means providing an electrical field for and connected to said last named means to cause a functioning thereof in response to a disturbance of such field, and means for maintaining such signal means in inoperative condition in the event of a disturbance in such electrical field occurring at or above a pre-determined rate.

11. A detecting system including a normally inoperative signalling means, means whereby such signalling may be actuated, means providing an electrical field for and connected to said last named means to cause a functioning thereof in response to a disturbance of such field, means for maintaining such signal means in inoperative condition in the event of a disturbance in such electrical field occurring at or above a predetermined rate, and means for likewise maintaining such signalling means inoperative in the event that changes in the capacity of such field occur at or below a pre-determined rate.

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