July 31, 1962 D. E. HANSEN 3,047,849

ELECTRONIC INTRUSION PROTECTION ARRAY SYSTEM

Filed Nov. 21, 1960 4 Sheets-Sheet 1

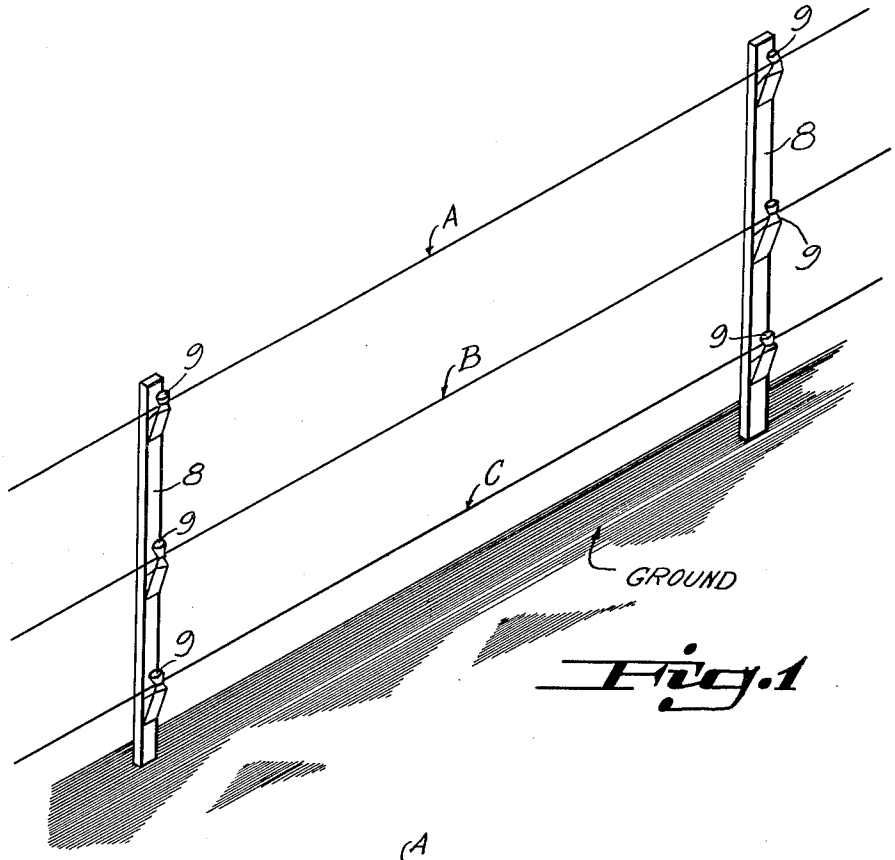


Fig. 1

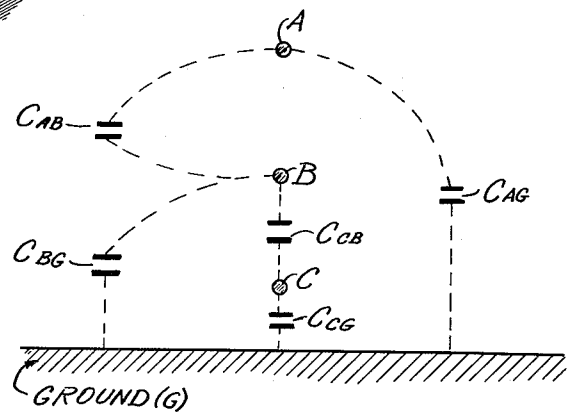


Fig. 2

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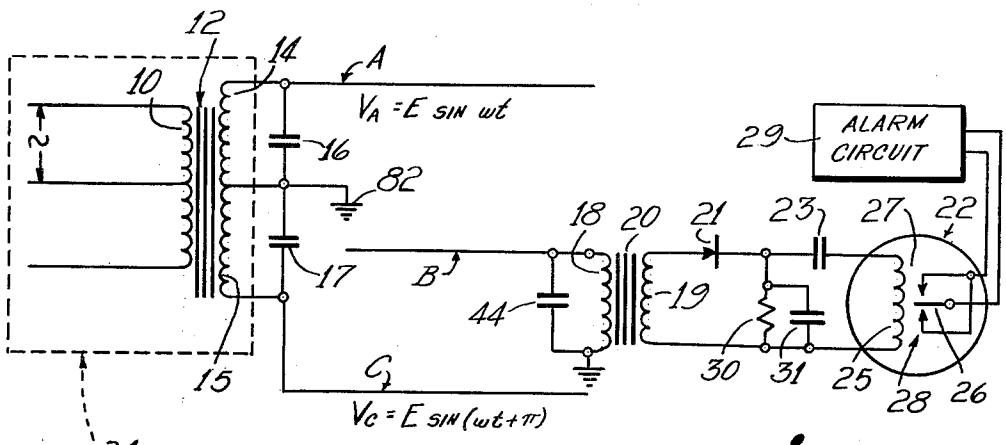
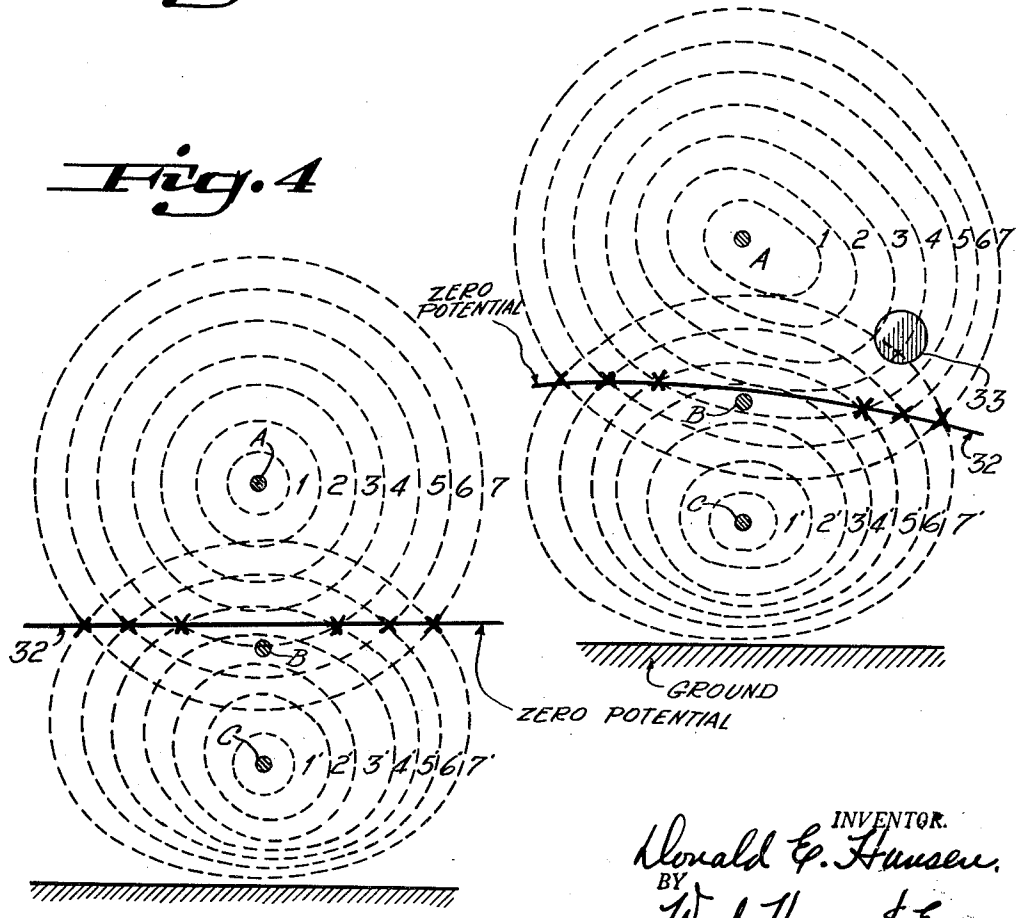


Fig. 3

Fig. 5

Fig. 4



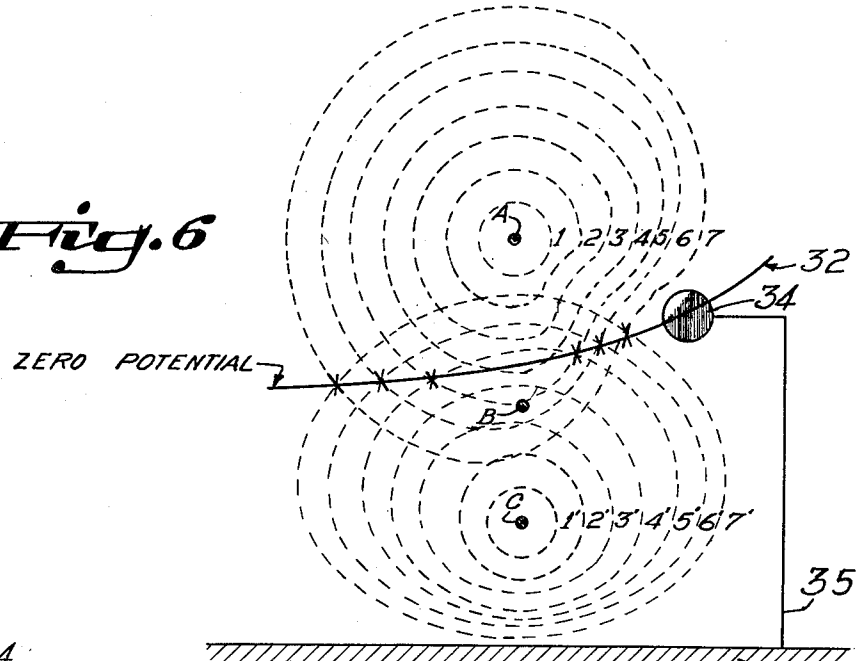
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ELECTRONIC INTRUSION PROTECTION ARRAY SYSTEM

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Fig. 6



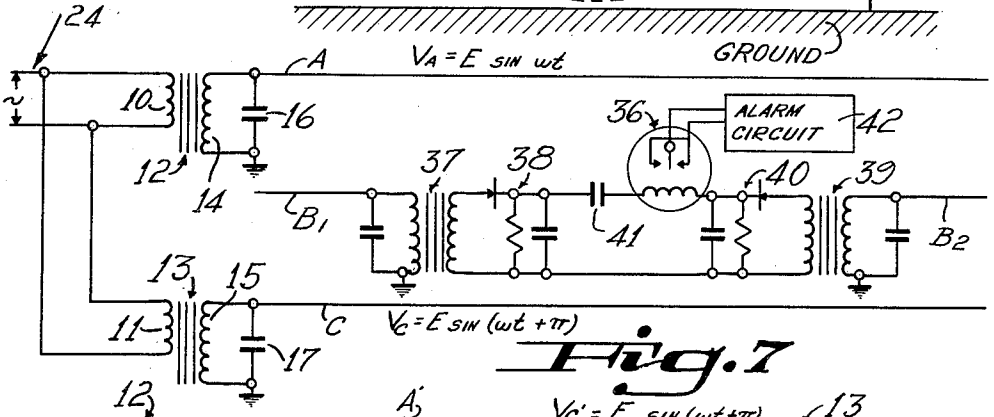


Fig. 7

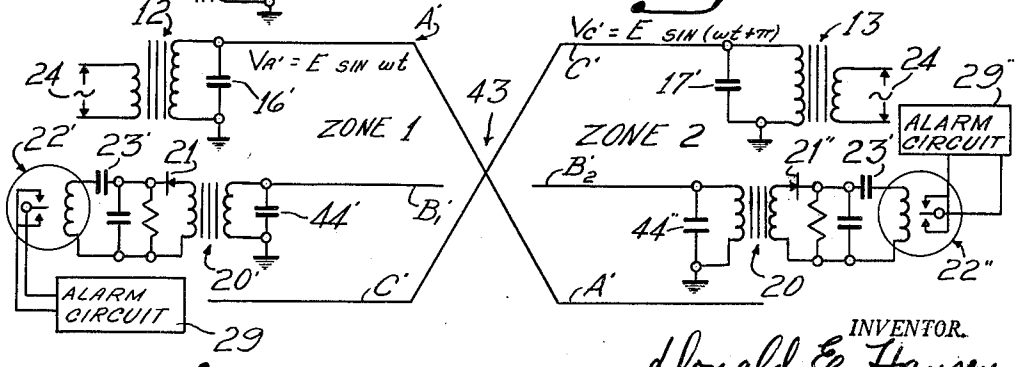


Fig. 8

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ELECTRONIC INTRUSION PROTECTION ARRAY SYSTEM

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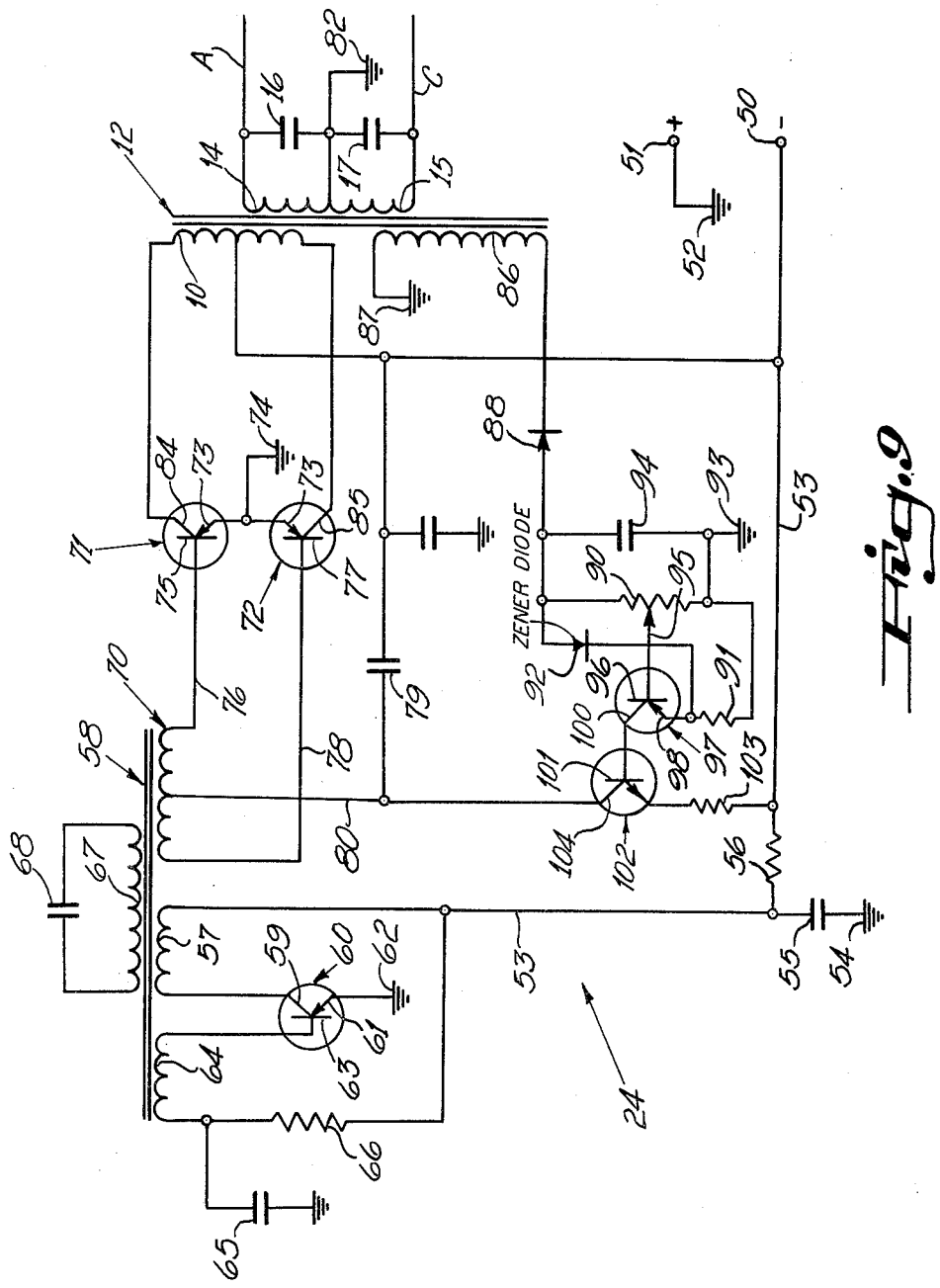


Fig. 9

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United States Patent Office 3,047,849 Patented July 31, 1962

3,047,849 ELECTRONIC INTRUSION PROTECTION ARRAY SYSTEM

Donald E. Hansen, Danbury, Conn., assignor to Mosler Research Products, Inc., Danbury, Conn., a corporation of Delaware

Filed Nov. 21, 1960, Ser. No. 70,581
11 Claims. (Cl. 340—258)

The present invention relates to electronic security protective alarm systems and is more particularly directed to an electronic intrusion protection system which utilizes an array of wires around the perimeter of an area to be protected. This application is a continuation-in-part of the copending application of Donald E. Hansen for "Electronic Intrusion Protection Array System," Serial No. 810,865, filed May 4, 1959, now abandoned.

At the present time, it is frequently necessary to protect large areas, such as airfields, missile launching sites, or the like, against unauthorized intrusion. It has previously been proposed to protect such large areas by means of a perimeter protection system including two wires extended about the perimeter of the area to be protected. In such systems of the prior art, it has been common to apply a potential to one of the two wires and to utilize any change of capacitance between the two wires as would be caused by the intrusion of a person to actuate an alarm.

Prior art systems of this type are subject to several inherent disadvantages. In the first place, such systems are very sensitive to weather changes with the result that on occasion false alarms have been caused solely by rain, snow or other environmental variations.

Another disadvantage of previously proposed capacity type protection systems is that they have not had a sufficiently high degree of sensitivity to provide the necessary degree of security. Moreover, when efforts were made to increase the degree of sensitivity, the prior systems tended to become highly unstable, again resulting in spurious alarms.

The principal object of the present invention is to provide an electronic perimeter alarm system which is exceedingly sensitive so that no unauthorized intrusions can occur without setting off the alarm; and yet is highly stable so that no spurious alarms occur.

Another object of the present invention is to provide an electronic perimeter protection system which is unaffected by changes in weather conditions.

More specifically, the present invention is predicated in part upon the concept of providing a protection array system comprising three spaced wires which extend about the periphery of the area to be protected. Two of these wires are connected to a transmitter operating in the lower RF range, i.e., from 10 to 30 kc./second. These two wires are connected to the transmitter in a manner such that the signals appearing on the wires are 180° out of phase. Each of these wires thus functions as a transmitting antenna and is surrounded by an electrostatic field, the fields of the two wires tending to oppose one another. The third wire of the array is disposed intermediate the two transmitting wires and functions as a detector line. This detector line is preferably positioned relative to the two antenna lines so that the detector line lies in or is slightly spaced from the zero potential plane formed by the two opposing electrostatic fields. It will be appreciated that the two potential carrying wires and detector line comprise spatially related means effective to create opposing electrostatic fields.

It will readily be appreciated that if just one antenna were energized, a voltage would be induced in the detector line. However, when both antennae are energized, in the operation of the present device, the opposed

fields in the vicinity of the detector line tend to "cancel one another out" so that depending upon the exact position of the detector line either no voltage or alternatively a very small voltage is induced in the detector line. In any event, this induced voltage is quite small compared to the potential applied to the antenna lines.

In accordance with the present invention, the detector line is coupled to a high impedance circuit including a voltage sensitive device, such as a galvanometer-type relay. In normal operation, the galvanometer relay, or the like, is adjusted so that its contacts are held in the open position. However, when an intruder approaches the array, his presence affects the fields surrounding the two antenna wires so that the zero potential plane is shifted, or viewed differently, the relative strengths of the two opposite fields at the detector line are changed so that a larger voltage is induced in that line. This voltage is effective to trip the galvanometer relay contacts and actuate an alarm.

The present invention further contemplates that the two antenna wires be connected as part of a resonant circuit, the capacity of which is many times as large as the natural capacitance of the antennae to ground. In accordance with the present invention, the detector line is also connected to a similar resonant circuit also having a capacity substantially larger than the normal capacity of the detector line to ground.

As a result, the present array system is completely insensitive to changes in weather conditions, since any change in capacitance of the lines to ground caused by variations in weather are relatively insignificant compared to the large capacitance provided in the resonant circuits.

A further advantage of the present invention is that it facilitates the use of a high impedance, or high "Q" detector circuit. This in turn provides high sensitivity of the system while at the same time facilitating the use of low voltages on the antenna lines. The use of low voltages on the antenna lines in turn renders the system extremely stable.

The use of a low potential signal on the antenna lines also is advantageous from a safety point of view since it eliminates the possibility of accidental electrocution. Moreover, it lowers the power consumption required for for operating the system.

Another aspect of the present invention is the provision of a transmitter having means to automatically maintain a substantially constant signal level on the antenna despite variations in antenna resistance or capacitance due to weather changes, or the like. Consequently, not only is the present system free from spurious alarms caused by weather changes, but additionally the sensitivity of the system is kept substantially constant under all conditions.

These and other objects and advantages of the present invention will be more readily apparent from a consideration of the following detailed description of the drawings illustrating preferred embodiments of the invention.

In the drawings:

FIGURE 1 is a perspective view of a three-wire array mounted to provide perimeter protection in accordance with the present invention.

FIGURE 2 is a theoretical schematic cross-sectional view through a three-wire array particularly showing the various capacities between the wires of the array and between the wires and ground.

FIGURE 3 is an electrical schematic diagram of a three wire protective array system of my invention.

FIGURE 4 is a theoretical schematic cross-sectional view through a three wire array showing the equipotential surfaces of the electrostatic fields about the potential carrying wires and particularly showing one place-

ment of the center detector line with respect to the zero potential plane.

FIGURE 5 is a view similar to FIGURE 4 but showing the effects of an insulated intruding body upon the electrostatic field and upon the induced voltage on the detector line.

FIGURE 6 is a theoretical view similar to FIGURE 4 but showing the effects of a grounded intruding body upon the electrostatic field and the detector line induced voltage.

FIGURE 7 is a modified form of the system of my invention in which the detector line is divided into segments which share a common relay and alarm circuit; and

FIGURE 8 is another modified form of the system of my invention in which the excited array are transposed between individual detector zones for greater stability against the effects of snow.

FIGURE 9 is a schematic circuit diagram of a transmitter constructed in accordance with the principles of the present invention.

FIGURE 1 illustrates one preferred form of perimeter protective array constructed in accordance with the principles of the present invention. It is to be understood that the array shown in FIGURE 1 is stretched around the perimeter of a field, group of buildings, or other area to be protected. Alternatively, if it is desired to provide perimeter protection for a large building, the array may be mounted along the building wall either inside or ouside the building.

As is shown in FIGURE 1, the array comprises three spaced parallel electrically conductive wires designated A, B and C. In the preferred embodiment, wire B is disposed substantially at the mid point between wires A and C. Each of the wires A, B and C is mounted upon supporting posts **8**, or the like, by means of suitable glass or ceramic insulators **9**.

In accordance with the present invention, lines A and C function as transmitting antennae, while line B functions as a receiving antenna, or the detector line. Specifically, as is explained in detail below, lines A and C are connected to a suitable transmitter which is effective to apply a signal to each of the lines having a frequency in the low RF range; i.e., from 10 to 30 kc./second, the voltages applied to each of the lines being out of phase with one another.

It will readily be appreciated that the voltage applied to each of these lines causes an electrostatic field to be built up around each of the lines and in the neighborhood of the detector line B. The present system depends for its operation upon the fact that whenever either or both of the fields surrounding the transmitter antennae is disturbed by the intrusion of an object, a voltage is induced in the detector line. This voltage is used to actuate an alarm signalling the presence of an intruder.

It will also be appreciated that lines A and B because of their length, area and physical proximity also form an electrical condenser. The same is true of lines C and B. Additionally, each of the lines A, B and C has an electrical capacity to ground G dependent in part on the length and size of the line and its distance from ground. These capacities are schematically shown in FIGURE 2. In that figure, the capacity C_{AB} represents the capacity between lines A and B, the capacity C_{AG} represents the capacity between line A and ground and so forth. The capacities indicated actually represent those existing on a short length of the array; i.e., a micromicrofarads per foot.

As illustrated in FIGURE 3, line A is connected to a transmitter effective to apply to line A an alternating voltage $Va=E \sin \omega t$ as indicated. The frequency of the voltage is preferably between 10 to 30 kc./second. Line C is also connected to an alternating voltage on the same frequency as line A but with a 180 degree phase difference as indicated by the voltage $Vc=E \sin (\omega t+\pi)$.

This 180 degree phase shift is obtained by connecting the center tapped primary windings **10** of output transformer **12** in parallel in such a manner that the respective output voltages of the secondary windings **14** and **15** are 180 degrees out of phase. These primary windings are connected in parallel with a transmitter, or A.C. voltage generating source, indicated at **24**. The secondary windings **14** and **15** respectively connected in parallel with capacitors **16** and **17** form tuned circuits which inductively couple lines A and C to the primary winding **10**. As shown in FIGURE 3, these tuned circuits are respectively connected between lines A and C and ground. The peak voltages E do not necessarily have to be equal as has been indicated.

The details of one preferred form of transmitter **24** can best be seen in FIGURE 9. As there shown, the transmitter includes a D.C. power source, such as a rectifier or battery, having a negative terminal **50** and a positive terminal **51** which is grounded as at **52**. Terminal **50** is connected to a line **53** which is grounded as at **54** through a resistor **56** and capacitor **55**. Line **53** is also connected to one lead of a primary winding **57** of transformer **58**. A second lead of winding **57** is connected to a collector **59** of an oscillator transistor **60**. This transistor includes an emitter **61** which is grounded as at **62**. The base **63** of transistor **60** is connected to one lead of a second primary winding **64** of transformer **58**. The second lead of this winding is grounded through capacitor **65** and is connected through resistor **66** to line **53**. A primary winding **67** of transformer **58** is shunted by a capacitor **68**.

Transformer **58** includes another winding **70** which is connected to transistors **71** and **72** which are connected to function as a push-pull amplifier. More particularly, each of the transistors **71**, **72** is provided with an emitter **73—73**. These emitters are tied together and grounded as at **74**. Base **75** of transistor **71** is joined to one lead **76** of winding **70**; while the base **77** of transistor **72** is joined to another lead **78** of winding **70**. Winding **70** is provided with a center tap which is connected to lead **80**. This lead is in turn connected through a capacitor **79** to primary winding **10** of transformer **12**. Winding **10** is provided with two leads which are respectively connected to collectors **84—85** of amplifier transistors **71** and **72**.

Transformer **12** includes secondary windings **14** and **15** which are grounded as at **82** and are respectively connected to antenna lines A and C. Primary windings **14** and **15** are shunted by capacitors **16** and **17** as was explained above.

In addition to windings **10**, **14** and **15**, transformer **12** includes a winding **86** having one lead grounded as at **87** and having a second lead connected to a rectifier **88**. This rectifier applies a portion of the rectified output of amplifiers **84** and **85** to a bridge circuit including resistors **90** and **91** and Zener diode **92**. The bridge is grounded as at **93** and a capacitor **94** interconnects the juncture of diodes **88** and **92** to ground. A potential of the bridge circuit is taken from resistor **90** by tap **95** joined to the base **96** of transistor **97**. The emitter **98** of this transistor is connected to diode **92** while the collector **100** of transistor **97** is connected to base **101** of an amplifier transistor **102**.

The emitter of this amplifier transistor is connected to line **53** through resistor **103**; while the collector **104** of transistor **102** is connected to the center tap of winding **70**. Thus, any difference in the rectified voltage of winding **86** is sensed by transistor **97**. This difference is amplified by transistor **102** which is in turn effective to provide a corrective D.C. bias signal to the bases of push-pull output transistors **71** and **72**.

Transmitter **24** is effective to apply alternating current signals to transmitter lines A and C. This signal has a frequency preferably in the lower RF range of from 10 to 30 kc./second. The magnitude of the signal, however, is relatively small, being of the order of 50 to 100

volts. The control circuit including the bridge described above and transistors 97 and 102 is effective to maintain this output voltage substantially constant despite any variations in antenna resistance or capacitance. Thus, the sensitivity of the system is automatically maintained despite any changes in weather conditions which may be encountered.

In FIGURE 2 the capacitors C_{AB} and C_{BG} form a voltage divider circuit by which the voltage on line A is coupled to line B. Also capacitors C_{CB} and C_{BG} form a reactive voltage divider circuit from line C to line B and some of the voltage on line C is coupled to line B. Since the voltages on lines A and C are 180 degrees out of phase with respect to each other the resulting coupled voltage on line B is lower than would be coupled by either line A or line C by itself. This is more readily understandable by reference to FIGURE 4, which will subsequently be explained. The magnitude of the voltage on line B will be affected by the distance to line A and to line C, from line B, by the distance lines A and C are above ground, and by the magnitude of the peak voltages E on lines A and C. In practice, a parallel resonant circuit consisting of transformer winding 18 and tuning capacitor 44 is connected between line B and ground. The resonant circuit raises the impedance of line B to ground above that of the reactance of C_{BG}. This causes the voltage on line B to be higher as one leg of the voltage divider circuit referred to in reference to FIGURE 2 has changed in value, the total capacity used to resonate with the inductor is many times greater than the capacity of line B to ground, therefore the impedance of line B to ground will not vary with changes in the capacity of line B to ground caused by weather changes. Parallel resonant circuits are also connected between line A and ground and line C and ground. As with line B, the resonant capacities are large so that weather changes will not vary the line impedance.

The voltage on line B is inductively coupled through winding 19 of transformer 20 to a diode 21 and rectified. The rectified voltage is monitored by a sensitive galvanometer-type relay 22 in series with a large condenser, shown at 23. The circuit is completed by load resistor 30 connected in parallel with galvanometer coil 25 and compensation condenser 23, and connected in parallel with filter condenser 31. In addition to coil 25 the galvanometer-type relay 22 contains the commonly connected, normally open, fixed contact members 27 and 28 and the movable contactor 26, movable therebetween and into electrical contact with either fixed contact member.

The system of my invention is installed around a perimeter and each of the coils 14, 18 and 15 of the conductors A, B and C, respectively, are resonated by means of their respective tuning capacitors 16, 44, and 17, with the lines in place and connected. The position of the line B with respect to lines A and C of the magnitude of the voltages on lines A and C may then be adjusted in order to give a null voltage condition on line B. In the specific circuit of FIGURE 3, the voltage on line B is not set to exactly equal zero in order to establish an operating bias voltage for diode 21. With this small D.C. voltage established, the condenser 23 charges to this value and the movable contactor 26 of the galvanometer-type relay 22 will assume a center position between fixed contacts 27 and 28. It will, of course, be understood that line B can be located so as to have a zero voltage in which case a bias voltage can be applied to diode 21 in any suitable manner. If the voltage on line B changes at a fast enough rate the sensitive galvanometer-type relay 22 will close contacts thus signalling an alarm by exciting the alarm circuit 29, electrically connected between movable contactor 26 and commonly connected fixed contacts 27 and 28, arranged to respond on closure of said contacts. This rate of voltage change to which the relay 22 will respond is set by the time constant of the galvanometer-type relay coil 25 and the condenser 23. In practice, for example, this time constant is normally set in the range of 3 to 10 seconds. Thus, very slow changes in the voltage on line B will not cause the galvanometer-type relay to excite the alarm circuit by closing the contacts.

Because the voltage on line B is the difference between that coupled from line A and line C, the voltages on lines A and C may vary simultaneously without causing an alarm. Change in the coupling between lines such as may be caused by a change in dielectric of the line to line capacities due to weather, will not cause an alarm, since the voltages coupled from line A and line C will be equally affected. When a person or an object attempts to pass through the array of wires, the balance of the system is disrupted, since only one of the coupled voltages is substantially affected. This may be more readily understood with reference to FIGURE 4. In FIGURE 4, I have shown an approximation of the equipotential surfaces of the electrostatic fields about the lines A and C at any instant of time t. The equipotential surfaces about line A are schematically indicated by lines 1–7 while the equipotential surfaces of the electrostatic field about line C are schematically indicated by lines 1′–7′. As the potentials on lines A and C are 180 degrees out of phase with respect to each other, the equipotential surfaces 1–7 around lines A are negative with respect to the equipotential surfaces 1′–7′ around line C. Thus, if the corresponding equipotential surfaces of lines A and C respectively are of equal absolute magnitude and opposite polarities, their respective points of intersection marked at X determine a plane of zero potential, as indiacted at 32, as the zero potential line.

As previously mentioned, in the specific embodiment shown, line B is arranged so as to have a small induced voltage thereon as an operating bias voltage for diode 21. It will be noted in the various drawings, and especially in FIGURES 4, 5 and 6, that line B is not symmetrically spaced with respect to lines A and C. If line B was positioned to intersect the zero potential line 32, there would be no induced voltage thereon and, therefore, a separate operating bias would have to be provided for diode 21. For this reason in one preferred embodiment line B is positioned to one side of the zero potential line 32 so that there is a slight induced potential coupled to said line. The position of the zero potential line between lines A and C is dependent upon the voltage magnitude on each of said lines, and in turn the positioning of line B with respect to lines A and C is dependent upon the position of the zero potential line 32.

An intruding body, such as shown at 33 in FIGURE 5, acts to deform the equipotential surfaces of the electrostatic fields of lines A and C when it enters the electrostatic field about the array, and since it can only effect one field primarily, an alarm will result due to the change in induced voltage on line B. If the intruding body 33 is insulated from ground it will act as a partial change in dielectric of either the line-to-line or line-to-ground capacitance of one of the wires depending upon the point of intrusion with respect to the wires. This will have the effect shown in FIGURE 5, distorting the equipotential surfaces of the electrostatic fields about the lines A and C so as to shift the position of the zero potential line. From FIGURE 5 it can be seen that the zero potential line is almost intersecting line B, thus indicating a decrease in the voltage coupled to line B. Since the galvanometer-type relay in the rectifier circuit was balanced to a certain voltage potential, this change in voltage on line B to very near a null condition causes a reduction in the rectified voltage from diode 21, thus unbalancing the circuit and closing the contacts in relay 22 to excite the alarm circuit 29. If the intruding body 34 is grounded as indicated at 35, the effect will appear as in FIGURE 6. In this instance, the grounded body has distorted the field, such as to shift the zero potential line closer to line

A and thus increasing the distance from line B to said zero potential line. This means a greater voltage is coupled to line B which increases the current flow in the rectifier circuit, thus energizing the galvanometer-type relay **22** and exciting the alarm circuit **29**. The fact that the zero potential lines in FIGURES 5 and 6 have changed their position in relation to line B from that in FIGURE 4 indicates that an alarm would be given, since the coupled voltage on line B has actually changed. Normally, a person approaching an array is at or very near ground potential, unless the person is at a considerable distance from ground. When the voltages on lines A and C are high enough, as they can be with this array, an intruder cannot pass the array without causing enough unbalance to give the alarm signal. The line voltages can be as high as desired for sensitivity requirements without instability since the voltage on line B can be adjusted to the same small value by positioning line B slightly to one side of the zero potential line.

In FIGURES 7 and 8 I have shown modified arrangements of the array system of my invention which provide an aid to greater system stability, especially where longer perimeter lines are involved. In the arrangement shown in FIGURE 7, the connection and arrangement of lines A and C is identical to the arrangement thereof shown in FIGURE 3. In this form, however, line B has been divided into shorter segments such as line B_1 and line B_2. Each of these lines in turn is transformer-coupled to its own rectifier circuit, each of the rectifier circuits being similar to that shown in FIGURE 3, except that in this form a galvanometer-type relay **36** is connected in series between the two rectifier circuits. Line B_1 is inductively coupled through coupling transformer **37** to rectifier circuit **38**. Line B_2 is inductively coupled through coupling transformer **39** to rectifier circuit **40**. Rectifier circuits **38** and **40** are connected in series through capacitor **41** and galvanometer-type relay **36** which is connected to control alarm circuit **42**. With this divided arrangement of the center line into lines B_1 and B_2, any change in voltage on line B_1 due to weather conditions would be balanced out by a corresponding change in the voltage on line B_2.

In FIGURE 8 I have shown a modified arrangement of my invention which provides increased stability against the effect of snow. The center line is divided into segments B_1' and B_2' having individual rectifier and alarm circuits. This then gives a zoned arrangement to the system and facilitates faster determination of the point of perimeter penetration when an alarm is excited. Although I have only illustrated two zones, the perimeter can be divided into as many zones as desired. Line B_1' is coupled through transformer **20'** to the rectifier circuit containing crystal diode **21'** and its associated circuit components including capacitor **23'** and galvanometer-type relay **22'** which is connected to its associated alarm circuit **29'**. Line B_2' is coupled through transformer **20''** to the associated rectifier circuit containing diode **21''** and its associated circuit components including capacitor **23''** and galvanometer-type relay **22'** connected to its alarm circuit **29''**. It will be noted that these rectifier circuits are the same as that shown in FIGURE 3.

The perimeter lines A' and C' carrying voltages

$$V_a = E \sin \omega t \text{ and } V_c' = E \sin (\omega t + 180°)$$

respectively are disposed about the perimeter area such that the terminating end of line C' is associated with the transformer coupled end of line A' and vice versa. In addition, the lines A and C are transposed between the zones as shown at **43**. Greatest stability is obtained when the transposition is at the center of the lines. By using the arrangement I have shown in FIGURE 8, greater system stability is obtained. Line A' is coupled through transformer **12** to A.C. voltage generating source **24** while line C' is coupled through transformer **13** to the same A.C. voltage generating source **24**. As in FIGURE 3, the transformer windings **14** and **15** are connected in such manner that the output voltages thereof are 180 degrees out of phase with respect to each other. This transposition at the center of the potential carrying lines for greater stability also can be utilized where the terminating and transformer coupled ends of these lines are coincident.

From the foregoing disclosure of the general principles of the present invention and the above description of two embodiments, those skilled in the art will readily comprehend the many modifications to which the invention is susceptible. Thus, for example, the three wires A, B and C can be disposed in a horizontal plane with line B disposed between lines A and C. Lines A and C are connected to a transmitter, such as transmitter **24**, and line B is connected in circuit with a galvanometer-type relay as described above. Additionally, if still greater protection is desired, two or more sets of three horizontally disposed wires can be provided.

Having described my invention, I claim:

1. A perimeter protective array system comprising spatially related means creating overlapping opposing electrostatic fields, a pair of said overlapping opposing electrostatic fields defining a plane of zero potential therebetween, means disposed in close proximity to said plane of zero potential for receiving induced voltage from said pair of said overlapping opposing electrostatic fields, a rectifier circuit, a galvanometer-type relay, an alarm circuit, said galvanometer-type relay being inductively coupled to said last mentioned means through said rectifier circuit to excite said alarm circuit upon detection of a distortion of said overlapping opposing electrostatic fields.

2. In a perimeter protective array system, a pair of perimeter extending wires transformer-coupled to a common A.-C. voltage generating source, the perimeter extending wires of said pair of perimeter extending wires carrying voltages 180 degrees out of phase with each other, a pair of detector lines extending axially with respect to each other intermediate said pair of perimeter extending wires and coextensive therewith and arranged to receive induced voltages therefrom, said pair of detector lines independently inductively coupled to individual rectifier circuits, said individual rectifier circuits being independently responsive to changes in the respective received induced voltages, and said individual rectifier circuits connected in series through a common alarm circuit actuating relay which is balanced against the received induced voltages of said pair of detector lines for greater system stability against the affects of weather.

3. A perimeter protective array system comprising a pair of voltage-carrying means spatially related with respect to each other and extending coincidentally about the perimeter of an area, each voltage-carrying means of said pair of voltage-carrying means being inductively coupled to a common voltage generating source on coincident ends thereof, said pair of voltage-carrying means transposed with respect to each other at the mid-point of the perimeter of the area, a pair of detector lines extending substantially axial with each other and extending coincidentally with said pair of voltage-carrying means from the ends thereof, each detector line of said pair of detector lines terminating adjacent the mid-point of the perimeter of the area, and said pair of detector lines inductively coupled to individual alarm circuits through individual rectifier and sensitive relay circuits for a more stable protective array system.

4. In a perimeter protective system, a pair of vertically spaced wires extending about said perimeter, circuit means including an A.C. transformer having two secondary windings for applying an alternating potential to each of said wires, the potential applied to one of said wires being 180° out of phase to the potential applied to the other of said wires, capacitors connected in parallel with each of said secondary transformer windings, said capacitors and secondary transformer windings being connected to

ground and being effective to form a tuned resonant circuit having a resonant capacitance substantially greater than the capacitance between the respective wires and ground, a detector wire disposed intermediate said potential carrying wires in asymmetrical relationship therewith, whereby a voltage is induced in said detector wire, a second transformer, a capacitor and a primary winding of said second transformer connected in parallel between said detector wire and ground, said capacitor and transformer primary winding being effective to form a resonant circuit having a total capacity substantially greater than the capacity of the detector wire to ground, and detector alarm means in electrical connection with a secondary winding of said second transformer, said alarm means being responsive to a change in potential in the detector wire.

5. In a perimeter protective system, a pair of vertically spaced wires extending about said perimeter circuit means including an A.C. transformer having two secondary windings for applying an alternating potential to each of said wires, the potential applied to one of said wires being 180° out of phase to the potential applied to the other of said wires, capacitors connected in parallel with each of said secondary transformer windings, said capacitors and secondary transformer windings being connected to ground and being effective to form a tuned resonant circuit having a resonant capacitance substantially greater than the capacitance between respective wires and ground, a detector wire disposed intermediate said potential carrying wires in asymmetrical relationship therewith, whereby a voltage is induced in said detector wire, a galvanometer-type relay, circuit means comprising a rectifier and capacitor in series connection with said galvanometer, and alarm means connected to said galvanometer, whereby said alarm means are energized upon a rate of change of potential of said detector wire in excess of a predetermined rate.

6. In a perimeter protective system, a pair of vertically spaced wires extending about said perimeter circuit means including an A.C. transformer having two secondary windings for applying an alternating potential to each of said wires, the potential applied to one of said wires being 180° out of phase to the potential applied to the other of said wires, capacitors connected in parallel with each of said secondary transformer windings, said capacitors and secondary transformer windings being connected to ground and being effective to form a tuned resonant circuit having a resonant capacitance substantially greater than the capacitance between the respective wires and ground, a detector wire disposed intermediate said potential carrying wires in asymmetrical relationship therewith, whereby a voltage is induced in said detector wire, a capacitor and transformer primary winding connected in parallel between said detector wire and ground, said capacitor and transformer primary winding being effective to form a resonant circuit having a total capacity substantially greater than the capacity of the detector wire to ground, a galvanometer-type relay, circuit means energized by said primary winding, said circuit means comprising a rectifier and capacitor in series connection with said galvanometer, and alarm means connected to said galvanometer, whereby said alarm means are energized upon a rate of change of potential of said detector wire in excess of a predetermined rate.

7. In a perimeter protective system, a pair of vertically spaced wires extending about said perimeter, a transmitter having an RF output, circuit means including a transformer having two secondary windings for applying a RF signal output to each of said wires, the signals in said wires being out of phase relative to each other, circuit means connected to each of said wires for forming a tuned resonant circuit having a resonant capacitance substantially greater than the capacitance between the respective wires and ground, a detector wire disposed adjacent said potential carrying wires, circuit means connected to said detector wire and forming a resonant circuit having a total capacity substantially greater than the capacity of the detector wire to ground, and high impedance circuit means in circuit connection with said detector wire for actuating an alarm in response to a change of potential in the detector wire.

8. In a perimeter protective system, a pair of vertically spaced wires extending about said perimeter, circuit means including an A.C. transformer having two secondary windings for applying an alternating potential to each of said wires, the potential applied to one of said wires being 180° out of phase to the potential applied to the other of said wires, capacitors connected in parallel with each of said secondary transformer windings, said capacitors and secondary transformer windings being connected to ground and being effective to form a tuned resonant circuit having a resonant capacitance substantially greater than the capacitance between the respective wires and ground, a detector wire disposed intermediate said potential carrying wires, a second transformer, a capacitor and a primary winding of said second transformer connected in parallel between said detector wire and ground, said capacitor and second transformer primary winding being effective to form a resonant circuit having a total capacity substantially greater than the capacity of the detector wire to ground, and detector alarm means in electrical connection with a secondary winding of said second transformer, said detector alarm means being responsive to a change in potential in the detector wire.

9. In a perimeter protective system, a pair of vertically spaced wires extending about said perimeter circuit means including an A.C. transformer having two secondary windings for applying an alternating potential to each of said wires, the potential applied to one of said wires being 180° out of phase to the potential applied to the other of said wires, capacitors connected in parallel with each of said secondary transformer windings, said capacitors and secondary transformer windings being connected to ground and being effective to form a tuned resonant circuit having a resonant capacitance substantially greater than the capacitance between respective wires and ground, a detector wire disposed intermediate said potential carrying wires, a galvanometer-type relay, circuit means comprising a rectifier and capacitor in series connection with said galvanometer, and alarm means connected to said galvanometer, whereby said alarm means are energized upon a rate of change of potential of said detector wire in excess of a predetermined rate.

10. In a perimeter protective system, a pair of vertically spaced wires extending about said perimeter, a transmitter having a RF output, circuit means including a transformer having two secondary windings for applying said RF signal output to each of said wires, the signals in each of said wires being out of phase relative to each other, circuit means connected to each of said wires for forming a tuned resonant circuit having a resonant capacitance substantially greater than the capacitance between the respective wires and ground, a detector wire disposed intermediate said potential carrying wires, circuit means connected to said detector wire to form a resonant circuit having a total capacity substantially greater than the capacity of the detector wire to ground, and high impedance circuit means in circuit connection with said detector wire for actuating an alarm in response to a change of potential in the detector wire, said transmitter including feed-back means responsive to the signal applied to said lines for maintaining the signal applied to said lines substantially constant despite changes in the resistance of capacitance of said lines.

11. A transmitter for use in a perimeter protective array system of the type comprising a pair of spaced antenna wires and an intermediate detector wire, said transmitter comprising an oscillator, a push-pull amplifier connected to the oscillator output for amplifying the output of said oscillator, a transformer having a primary winding connected to said amplifier and a secondary winding

connected to said antenna wires, and a third winding, a bridge circuit interconnected to said third winding, and a second amplifier having an input lead connected to said bridge, the output of said second amplifier being responsive to a potential in said bridge circuit, and circuit means connecting said second amplifier to said push-pull amplifier, the output of the second amplifier controlling a bias on said push-pull amplifier so that a substantially constant signal potential is applied to said antenna wires.

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