Send to: NANCHAHAL, NEHA
PIERCE LAW CENTER
2 WHITE ST
CONCORD, NH 03301-4176

Time of Request: Wednesday, August 01, 2007 11:57:28 EST
Client ID/Project Name:
Number of Lines: 230
Job Number: 1862:40503753

Research Information

Service: Terms and Connectors Search
Print Request: Current Document: 57
Source: Utility, Design and Plant Patents
Search Terms: inventor(robert /2 rines)

57 of 81 DOCUMENTS

UNITED STATES PATENT AND TRADEMARK OFFICE GRANTED PATENT

2571164

Link to Claims Section

October 16, 1951

Electric system

INVENTOR: RINES ROBERT H

APPL-NO: 25241 (02)

FILED-DATE: February 18, 1946

GRANTED-DATE: October 16, 1951

PRIORITY: May 5, 1948 - 19480025241, United States (US); February 18, 1946 - 19460648482, United States (US)

PUB-TYPE: October 16, 1951 - Utility Patent having no previously published pre-grant publication (A)

PUB-COUNTRY: United States (US)

US-MAIN-CL: 348#162

US-ADDL-CL: 252#62.9R, 307#400, 329#370, 361#311, 382#312

CL: 348, 252, 307, 329, 361, 382

SUMMARY:

The present invention relates to electric systerns, and more particularly to radio-receiving systems that, while having more general fields of usefulness, are especially adapted for use in television. The present application is filed in r sponse to a requirement for division in application, Serial No. 648,482, filed February 18, 1946.

An object of the invention is to provide a new and improved radio-receiving system.

Another object is to provide a new and im- 1(1 row, this is merely for illustrative purposes, in proved electret.

A further object is to provide a novel electret element that is adapted to receive and rectify radio waves.

Other and further objects will be explained 5 hereinafter and will be more particularly pointed out in the appended claims.

The invention will now be more fully explained in connection with the accompanying drawings, in which Fig. 1 is a diagrammatic view of ci cuits and apparatus arranged for radio-location purposes; Pig. 2 is a view of a modification; Fig.

is a diagram showing an airplane object from which radio waves are reflected and scattered to the receiving system of Fig. 1; and Fig. 4 is a view of a further modification.

An electromagnetic-wave generator 4 is shown exciting a dipole 2 to produce ultra-high-frequency pulsed-radio energy, say, of 3 or 1.5 centimeters wavelength. A continuous-wave or any ,;i; spending view of the object 8. The pick-up eleother type of modulated-wave generator may be employed, but pulsed energy, at present, has the advantage of economical and easy high-power ultra-high-frequency generation.

The waves emitted by the dipole 2 may be di- 3;; array rected by a reflector 3 upon a parabolic reflector 6. The parabolic reflector 6 is shown directing the waves toward an object, say, an airplane 8, from which they are reflected and scattered toward a receiving station.

At the receiving station, the radio waves thus reflected and scattered from the object 8 may be focused by an electromagnetic dielectric lens 5, such as polystyrene, upon a bank or array T comprising a plurality of normally ineffective radioreceiving pick-up unit antenna elements. The dielectric lens 5 may be replaced by any other type of well-known lens, such, for example, as a wave-guide lens, mirror or other directive system for focusing the electro-magnetic energy scattered and reflected from the object 8 on the bank or array 7 of pick-up elements.

The pick-up elements of the bank or array 7 are shown arranged in the form of rows and columns, in the proximity of the focal plane ,of g the lens 5. The first or uppermost row of the bank is illustrated as comprising the sections 10, 12, 14, 16, etc shown as equally spaced horizontally. The second row from the top is shown B comprising the sections 18, 20, 22, etc. The third or next-lower row is shown comprising the sections 24, 26, etc and so on for the remaining rows of pick-up elements. Though only a small number of pick-up units is shown in each order not to confuse the disclosure. It will be understood that, in practice, a large number of pick-up units will be employed in each row, say, The sections 10, 18, 24, etc are arranged in the first or right-hand column. The sections 12, 20, 26, etc are disposed in the second column from the right. The sections 14, 22, etc are disposed in the third column from the right, and so on. There may be as many columns as there are pick-up units in each row. Though each column is shown as comprising only a few pickup units, this is again in order not to complicate the drawings.

The pick-up units will, of course, all receive the reflected or scattered radio waves through the lens 5 simultaneously. There will be focused on each pick-up unit a radio-frequency voltage corresponding to the scattering from a corements will thus receive different field strengths of radio energy, corresponding to the amount of energy reflected or scattered from the various parts of the object 3 and converged upon the of pick-up elements by the lens 5. A radio-energy picture of the object 8, as will be presently explained, is thus recorded upon the array, specific elemental areas of which will correspond to specific elemental areas of the object 8- Bv means of the present invention, this radio-energy picture may be converted into a visible picture 123. According to the preferred embodiment of the invention, the visible picture 123 is caused to appear upon the fluorescent viewing screen 106 of a display cathode-ray oscilloscope tube 90. Though the tube 90, and also the hereinafter-described cathode-ray oscilloscope-like member 89, are shown operating on the electrostatic principle, magnetic deflection or a combination of magnetic and electrostatic forces may be employed. The invention provides a means for producing upon the screen 106 images corresponding to the radio-frequency energy received by the pick-up elements.

Provision is made for first rendering the normally ineffective pick-up units 10, 12, 14, IB, etc of the first row successively effective momentarily in the display circuits; for then rendering the pick-up units 18, 20, 22, etc of the second row successively effective momentarily; for then B sweeps out the successive rows of the array 7.

rendering the pick-up units 24, 26, etc of the third row successively effective momentarily; and so on.

The pick-up units are shown arranged in an sorb the incident radio-frequency energy. The insulating disc 9 at the screen end of the oscilloscope-like member 89, and the pick-up units may be constituted of electrets.

An electret is a permanently charged dielectric formed by filling the gap between two electrodes with, for example,

molten resin, carnauba wax, or beeswax, and subjecting the electrodes to high voltage. By allowing the wax to cool during the application of the high voltage, a solidified permanently charged electric dipole is produced, having permanent piezo-electric properties. Investigations in this field are described, for example, by A. Gemant in the Philosophical Magazine, S. 7, vol. 20, No. 136, suppl. November 1935, pages 929 to 952.

As described by W. G. Cady in Piezoelectricity, McGraw-Hill, page 235, mixtures of the resin or carnauba wax with other dielectric substances have produced long-lasting electrets. It will presently be explained that if these dielectric bases are combined in the same manner with receiving circuits comprising these tuned elecradio-absorbing-and-rectifying materials, such as silicon or uranium oxide, the electrets can be particularly well adapted to the purposes of the present invention. One of the electrodes of the electret, furthermore, may serve to enhance the response to radio energy if, for example, it is tuned to the radio waves, such as if it is onequarter of a wave-length long.

The pick-up units previously described may be such electrets. The first row of units is shown & lt;io temperature coefficients are negative, changes composed of charged dielectrics 10, 12, 14, 16, etc provided with top electrodes 110, 112, 114, 116, etc respectively, and a common strip 43.

The second row of units similarly is shown comprised of charged dielectrics 18, 20, 22, etc provided with top electrodes 118, 120, 122, etc and a common strip 51 connected to the strip 43.

Similarly the third row is shown composed of charged dielectrics 24, 26, etc with top electrodes 124, 128, etc and a common terminal strip go suit of the detection or rectification in the above57 connected to the other common strips 43, and 51. The strips 43, 51 and 57 are shown connected by a conductor 78 to a grounded impedance 58, in the innut circuit of an amplifier 79.

The cathode-ray-oscilloscope-like member 89 used for the particular illustrative radio-waveis shown provided with a cathode 95, a controlgrid electrode 93 and an anode 97. Electrons emitted from the cathode will become enabled, in response to proper stimulation of the grid 93, to pass by the grid 93 to the anode of the member 89. The electrons will continue to travel in a stream from the anode 97, between a pair of vertically disposed deflector plates 99 and 101, of which the plate 99 is shown grounded, and between a pair of horizontally disposed deflector plates 103 and 105, of which the plate 105 is shown grounded, to impinge finally on the disc S of the member 89. A horizontal-sweeptime base, applied, as hereinafter more fully explained, to the vertically disposed deflector ro upon areas of different potential of the variously plates 99 and 101, will cause the electron stream from the cathode 95 to become deflected horizontally, and a vertical-sweep-time base, applied to the horizontally disposed deflector plates 103 and 105, will cause the electron stream to become deflected vertically. The rows of electret pick-up units may be positioned along the successive paths of the electron stream to enable the stream to impinge on them as it successively If, accordingly, the lens 5 is caused to focus the radio-energy picture on the oscilloscope-like member 89, the bank of electrets will act to ababsorbed radio-frequency energy will alter the initial permanent polarizing static charge or voltage with which the electrets become sensitized during their preparation. This alteration resuits from several factors, including heating or pyroelectric effects, the negative temperature coefficients of resistance and the piezo-electric properties of the electrets. Silicon and uraniumoxide detectors are known to absorb radio-frequency energy and to exhibit negative temperature coefficients of resistance.

The energy absorbed by each electret is a measure of the intensity of the radio-frequency energy impinged thereon.

Across the electrodes of each electret, moreover, the radio-frequency energy will become rectified to produce direct-current potential differences.

These potential differences are representative of the radio-frequency energy impressed on the top tuned electrodes of the electrets in the radiotrodes, the detecting electrets and the grounded conductor 78. The rectification is produced by the detecting dielectric disposed between the electret electrodes. The variation of potential and charge along the bank

of electrets is thus a measure of the radio-frequency energy impinged on the array by the lens 5.

The resistance of the silicon or uranium oxide, as well as of the wax of the electret, since their with the intensity of the impinging radio-frequeney energy. A resistance variation is thus produced along the bank of electrets that is representative of the radio-frequency energy received by the respective electrets.

These three effects involving the change of the electret charge upon the absorption by the electrets of the radio-frequency energy, the production of the direct-current potentials as a rementioned radio-receiving circuits, and the resistance changes render the electret construction to which the present application is particularly directed extremely sensitive. With such electrets location purpose above described, a radio-energy image of the object 8 becomes thus recorded upon the array of electrets as charge, potential and resistance distributions.

QQ The bank of electrets may be scanned according to either of two principles or according to a combination of the same. One principle involves measuring the variation in the electric charge and potential of the bank at the moment that the electron stream impinges upon the successively disposed electrets to short-circuit them.

The other principle involves measuring in a grounded preferably linear amplifier 79 the current along the electron stream as it impinges resistive electrets, completing the circuit to the ground through the successive electrets by way of the conductor 78.

Each electret will absorb and rectify the radiofrequency energy. Dependent upon the magnitude of this-energy it will change the resistance and; the charge of the electret. This change will result both as a consequence of the absorption and of the rectifying action, byj the. electrets of the radio-frequency energy received by the electret electrodes. As the electron stream suecessively impinges upon the successively disposed electrets, during the scanning, it successively discharges them. This produces a corresponding change in the input voltage to. the amplifier 79, indicative of the radio-frequency energy impinged on the respective electrodes.

The electron stream will: instantaneously discharge each differently-charged and. differentlypotentialed electret to give an indication in the load 58 and the amplifier 79, or it will give rise to a change in the electron-beam current when it impinges upon the variously resistive electret elements, or there may be a combination of these effects.

The scanning of the electrets may obviously also operate on the principle of change in electron-beam current transmitted to the load 58 upon impinging on surf aces of various resistances.

As the stream hits these electrets of different resistances, a change in beam current occurs, which manifests itself in the input circuit of the amplifier 79.

Mosaics of electrets for the member 89 may also taken the form of Fig, 2, where electrets 81, 84, 86, 88 are provided with front electrodes 181, 184, 186, 188 exposed to the radio energy converged by the lens 5. The electrode strips 181 184, 186, 188 may be of length one-quarter of the wave-length of the radio waves and may be in the interior of the tube 89 facing the electron stream and may be scanned by it. The electrodes 281, 284, 286, 288 will be capacitively coupled to the front electrodes and will assume the homocharge of the electret Thus the_ elec- 10 tron stream will impinge on surfaces of different charge or potential and the scanning will take place according to the principles, previously dem diacent " 2 ZSSSrsST

by th & lt;& lt; T

the pick-up elements in the disc 9, they will suocessively discharge into the grounded preferably linear amplifier 79, by way of the conductor 78.

If desired, the amplifier 79 may be replaced by a bank of linear amplifiers, one corresponding to each of the pick-up elements.

The output of the amplifier will obviously vary, at successive instants, in accordance with ncy energy received by the sue- Psed oscilloscope deflector plates cessive corresponding pick-up elements.

A pulse generator, which may. if desired, be the same pulse generator 4, may be employed to trigger a horizontal-time-base-sweep circuit S3 circuit 59, according to fr on the fluorescent viewing screen conventional and well-known television technique. The pulse generator 4 may feed, through an attenuator and rectifier I, to an oscillator or any similar or equivalent television circuit. One such circuit is shown as a pulse-recurrence-frequency multiplier 65, for applying many pulses corresponding to each radio-frequency pulse for the period between successive radio pulses, to trigger the horizontal-sweep circuit 63. The horizontal-time-base sweep will thereby be produced between the vertically disposed deflector plates 99 and 101, occurring as many times, say, between successive radio-frequency transmissions, as there are rows of pick-up antennas.

The pulse generator 4 may also feed, through the attenuator and rectifier I, to trigger the vertical-sweep circuit 69, once corresponding to every radio-frequency transmission. One vertical sweep will then occur between the horizontally disposed plates 103, during the periods between successive radio pulse transmissions, corresponding to as many horizontal sweeps as there are rows of antennas, causing each of the horizontal sweeps to appear at successively lower levels on the oscilloscope-sweep face.

if the circuit 65 comprises an oscillator, the oscillations may be employed to trigger the horizontal sweep. The period of the oscillations which, as previously explained, is much less than the duration of each radio pulse, corresponds to the time of sweep across one row of the pickup units in the disc 9.

if, as previously mentioned, continuous-wave radio transmission is employed, the verticalsweep circuit 69 may be triggered to produce one vertical sweep corresponding to as many horizontal sweeps from the horizontal-sweep circuit 63 as there are rows of pick-up units.

Means is provided for producing upon the screen ,06 of the display oscilloscope 90, images corresponding to the radio-frequency energy received by the corresponding pick.up mosaic an_

tenna elements. The screen 106 is illuminated fey an electron stream in the oscmoscope 90.

Thig electron gtream .g synchron]zed to travel with the eectron stream of the cathode-ray.

like member M. The horizontal-sweet] circuit ig conneoted to the horizontal-deflector plate , of the oscilloscope 9!3 by a conductor 67, and horizontal-deflector plate IBI of the. oscilloscOT)e.uke membei- 38 by the conductor 67 and c:onductor ,,4 The verticai_sweep circult g9 ig connected to the Vertical-deflector plate 1:02 n a from the % elecije eco th"s successive connected, h the amplifier 79, to the control electrode Electrons emitted from the cathode 94 will come e able& gt; responsa to the action of the amplifier 79, to pass by the grid 92, to the anode 96 of the oscilloscope tube 90. The electrons will continue to travel in a stream from tne anode 96, between the pair of vertically disand 100, of which the plate 98 is shown grounded, and between the pair of horizontally disposed oscilloscope deflector plates 102 and 104, of which the plate 1 04 is shown grounded, to impinge flnalof the oscilloscope 90.

After each simultaneous horizontal sweep of both the oscilloscope 90, and the oscilloscope-like member 89 has been completed, a successively larger voltage will be applied to the horizontally disposed deflector plates 102, 104, and 103, 105, respectively, by the vertical-sweep circuit. After the last such horizontal sweep, the voltage between the horizontally disposed plates 102, 104 and 103, will become restored to zero. The next horizontal sweep, therefore, will start again at the first or top row.

Successively disposed areas of the screen 106 of the oscilloscope will therefore correspond to the similarly disposed mosaic-antenna sections in the disc 9 of the member 89. Each spot along a particular horizontal sweep, therefore, will become brightened on the screen 1 06 according to the amount of radio energy received by the corresponding pick-up element, and fed, by way of the amplifier 79, to the control electrode 92 of the cathode-ray

oscilloscope 90.

A more sensitive video signal device might be any well-known bridge detector of, say, the Wheatstone construction. If the electrets are connected in a direct-current series circuit, then the bank of condenser electrets may serve as an extremely sensitive radio-detecting element of a Wheatstone bridge, in which they may be balanced against fixed impedance elements 212, 214 and 2 1 6, as shown in Fig. 4. The short-circuiting or exploring of each successive electret by the electron stream, diagrammatically shown as shorting switches 205, 207, 20S, in parallel with the electrets 204, 206, 208, would thus be markedly indicated in the amplifier 79 and fed to the control electrode 92 of the display oscilloscope 90.

Although the invention has been described in connection with mosaic-antennas arranged in rows and columns, it will be understood that this is not essential, for other arrangements are also possible. Antennas arranged along concentric circles covering the field, or a continuous spiral, will also serve, though the oscilloscope arrangement would, of course, be correspondingly modifled. In the case of the concentric circles and the spiral, the antennas would be rendered effective in two-dimensional order, as in the case of , . . , -, T mi the rows and columns before described. The antennas disposed along one of the circles, for ex- 40 Number ample, would first be rendered effective, then those along the next circle, and so on.

Further modifications will occur to persons skilled in the art, and all such are considered to fall within the spirit and scope of the invention, 45 2.46& gt;476 as defined in the appended claims.

ENGLISH-CLAIMS:
Return to Top of Patent

What is claimed is:

1. An electret element having, in combination, two spaced electrodes and a polarized wax base containing a radio-wave absorber-and-rectifier inserted between the two electrodes.

2. An element of the character described comprising two spaced electrodes between which is disposed a permanently charged dielectric base combined with a radio-wave absorber-and-recsApparatus of the character described comprising an antenna connected to a permanently charged dielectric base combined with a radio wave absorber-and-rectifler.

4. A permanently charged element comprising two spaced electrodes between which is disposed a combination of a solidified polarized wax base and silicon.

5. A permanently charged element comprising two spaced electrodes between which is disposed a combination of a solidified polarized wax base and uranium oxide.

6. A permanently charged element comprising two spaced electrodes between which is disposed a combination of a solidified polarized wax base, silicon and uranium oxide.

7. A permanently charged element comprising two spaced electrodes between which is disposed a combination of a solidified polarized dielectric base selected from the group consisting of resin, carnauba wax and beeswax and a radio-wave absorber.

8. A permanently charged element comprising two spaced electrodes between which is disposed a combination of a solidified wax base selected from the group consisting of resin, carnauba wax and beeswax and radio-wave absorbing material selected from the group consisting of silicon and uranium oxide.

9. An electret element having, in combination, polarized wax and a radio-wave detecting material and provided

with an electrode tuned to the frequency of the radio waves.

The following references are of record in the file of this patent:

TTNTTrrcrn QTIATTTQ naTTFNrrc UJNlliiilJ oJ-AliLto jr A 1 .ciJN 1 fa Name Date 1,886,234 Meissner ---------- Nov. 1, 1932 1,969,379 Meissner ---------- Aug. 7, 1934 1,997,263 Meissner ---------- Apr. 9, 1935 2,024,70 Rutherford -------- Dec. 17, 1935 Meissner ---------- July 7, 1936 2,267,954 Schumacher -------- Dec. 30, 1941 2,429,823 Kinman et al. _____ Oct. 28, 1947 2,438,892 Becker ---------- Apr. 6, 1948 2,460,109 Southworth -------- Jan. 25, 1949 Investigations on Electrets," _ . nn -, ,_. _ , 7 VL 2 N" Suppl" NV

nl2:82

LOAD-DATE: November 14, 2005

1029ZH

********** Print Completed **********

Time of Request: Wednesday, August 01, 2007 11:57:28 EST

Print Number: 1862:40503753
Number of Lines: 230
Number of Pages: 7

Send To: NANCHAHAL, NEHA
PIERCE LAW CENTER
2 WHITE ST
CONCORD, NH 03301-4176