Sept. 4, 1923. 1,466,841

L. LEVY

ANTIPARASITIC SELECTING SYSTEM

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Fig. 1.

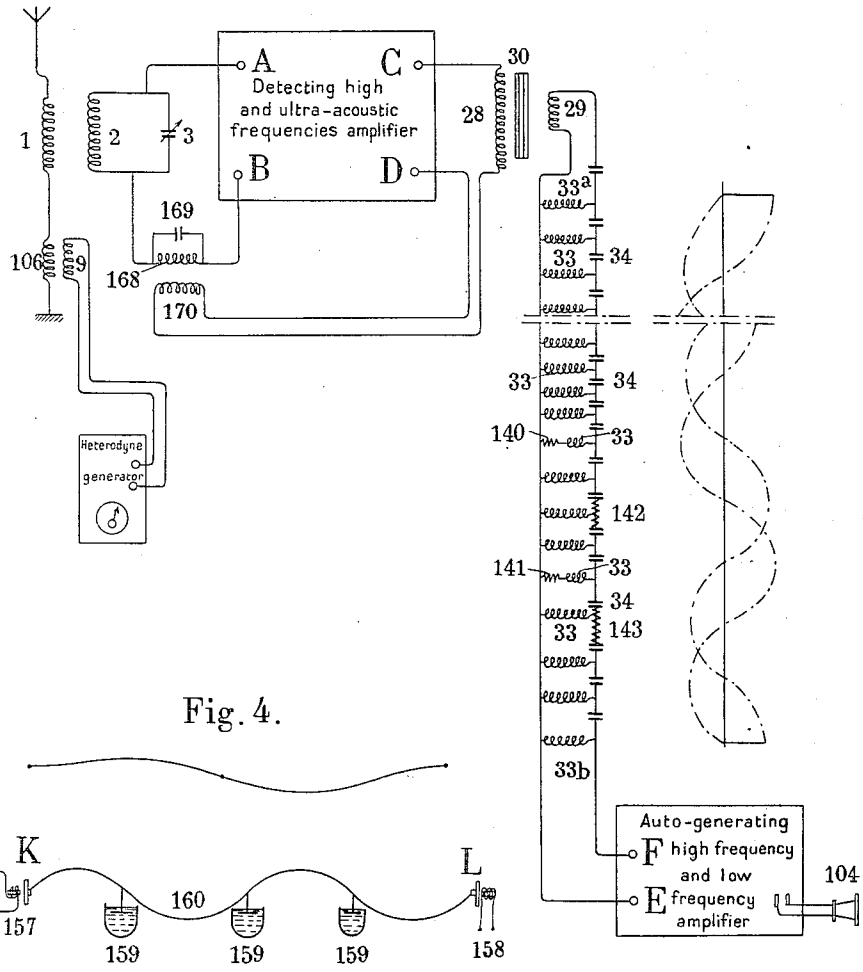


Fig. 4.

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Fig. 3.

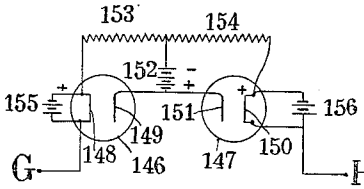


Fig. 5.

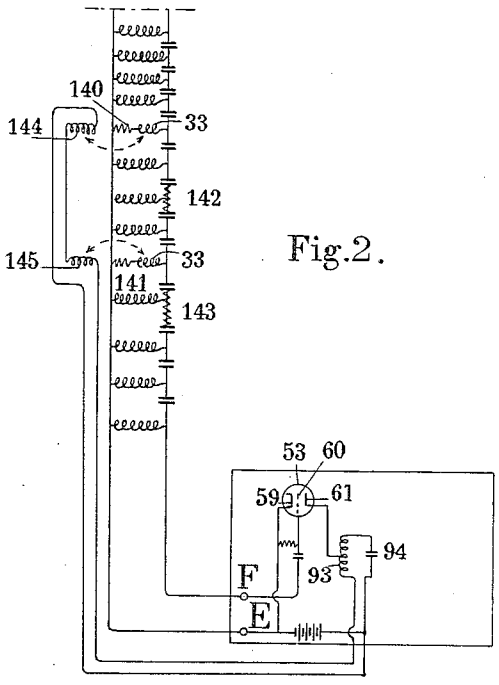
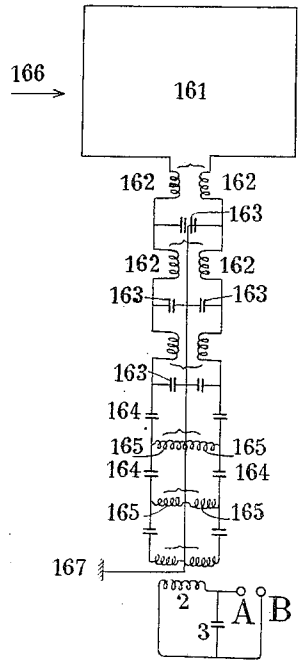


Fig. 2.



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UNITED STATES PATENT OFFICE.

LUCIEN LEVY, OF PARIS, FRANCE.

ANTIPARASITIC SELECTING SYSTEM.

Application filed August 7, 1920. Serial No. 401,948.

To all whom it may concern:

Be it known that I, LUCIEN LEVY, of 58 Rue de Verneuil, Paris, France, have invented Improvements in Antiparasitic Selecting Systems, of which the following is a full, clear, and exact description.

The present invention relates to an improvement in the receiving selective device for electric waves forming the subject-matter of the patent application filed on September 27th, 1919, under Sal. No. 326,993, and aims particularly at the separation of an electrical impulse of any duration whatsoever and of a short train of waves of a predetermined frequency, from a long train of waves of a predetermined frequency by means which are easy to use and to regulate.

Such means consist essentially in improvements in the artificial lines the utilization of which is provided for in the principal invention. Furthermore, these improvements apply not only to the artificial lines, but also to the real lines and in general to all systems over which waves (such as electrical, elastic, acoustic or the like) are adapted to be propagated and which are capable of vibrating in stationary waves for a predetermined frequency. All these methods of carrying out the invention permit of the improvement of the working of the receiving and selecting systems.

In the new arrangements which constitute the subject matter of the present invention, the well known fact is utilized that when a permanent order of stationary waves is established, the energy appears along the oscillating system in two forms, one being kinetic and the other potential, the maxima of potential energy coinciding with the minima of kinetic energy and vice versa.

Under these conditions, the invention comprises a method which consists broadly in arranging at those points of the system where one of the energies is minimum a system for absorbing this energy. It is evident that the consumption of energy is feeble in a permanent stationary state. On the contrary, during the variable state and for a free wave propagating itself over the system, the loss of energy will be great, because half the energy of the wave will give rise to losses.

In the accompanying drawings:

Figure 1 shows an improved anti-parasitic receiving station with a high selectivity for sustained waves.

Figures 2, 3, 4 and 5 represent modifications of detail.

I will now proceed to describe by way of example an application of this method to the electrical lines. This application is represented diagrammatically in the drawing annexed hereto and in which Figure 1 represents an arrangement of receiver and selector provided with an artificial line of the improved kind.

This arrangement is constituted very nearly like that represented in Figures 1 and 1ª of the patent application filed under Sal. No. 326,993; the same figures and reference letters denote the same parts. The amplifiers and the local generator are represented by rectangles without redrawing the internal connections which are indentical with those of this previous patent application.

In the new arrangement:

1. A reaction coil 170 is coupled to a coil 168 shunted through a condenser 169 and placed in series with the oscillating circuit 2, 3 so as to reamplify the ultra-acoustic current by the lamps of the amplifier. This reaction current might also be borrowed from the artificial line.

2. The amplifier of mean and low frequency has been placed directly at the end of the artificial line.

3. Resistances 142, 143 are arranged in series in the artificial line and at the antinodes of tension of the stationary waves develop therein the currents of ultra-acoustic frequency to be selected.

Furthermore, resistances 140, 141 are placed in series with the shunt elements (they might also be arranged directly in shunt) at the nodes of potential.

The resistances 142, 143 have for example the value

$$\sqrt{\frac{L}{C}},$$

L being the inductance of the coils 33 and C the capacity of the condensers 34.

Under these conditions, it is found as a matter of fact that the free waves are very attenuated, as are in general, the stationary waves, while only the currents of predetermined frequency to be selected pass without attenuation in any considerable degree when the permanent state is established.

It should be noted that the working is the more perfect the better the current is zero

at nodes, that is to say it is advantageous to reduce the distributed losses of the line, due above all to the resistance of the self inductances. These losses which are small may be compensated by supplying energy to the line at a sufficiently great number of points. For example the ultra-acoustic current amplified by the tube 53 of the principal invention may be caused to re-act at all the antinodes of tension on the shunt inductances by combining the circuits in such a way that the supply of power is the maximum for an impedance very much less than

$$\sqrt{\frac{L}{C}}$$

for example

$$\frac{1}{10}\sqrt{\frac{L}{C}}.$$

In Figure 2 is shown a modification of Figure 1 in which the current of the oscillating circuit 93, 94 is caused to react on the artificial line.

Inductances 144 and 145 are arranged in this circuit in series with the inductance 93 and are coupled to the coils 33 corresponding thereto placed at the antinodes of tension of the line.

In the scheme of connections just described, the resistances introduced consume power only to a very slight extent in permanent state and this fact is due precisely to the fact that they are not distributed uniformly, but placed at determined points. On the contrary, the compensating coils must be distributed as much as possible and coupled to the coils 33 with the suitable direction. The reaction will have only to furnish the losses of the line. Finally it is convenient to point out that the resistances may be advantageously replaced in these arrangements by current limiting systems.

These systems when employed alone have the disadvantage of limiting the current to a uniform value during the duration of a perturbation of great amplitude.

On the contrary, by combining them with an inverse artificial line, that is to say a capacity-inductance line, the duration of the limitation is small and of the order of the half period of the predetermined frequency to be selected, since the low frequencies cannot propagate themselves over the line.

The current limiting devices with two valves shown in Figure 3 between the points G and H would replace a resistance placed between these points. It is composed of two vacuum tubes 146, 147 having filaments 148 and 150 heated by batteries 155 and 156. The filaments are connected together by high resistances 153, 154 placed in series. The plates 149 and 151 are connected to the positive pole of a battery of a few volts 152.

The electrons can only issue from the points of the negative filament with respect to the plate and it is easy for a practical man to see that as soon as the tension over 153, 154 exceeds a certain value in one direction or the other, the tension of 149 or 151 becomes negative with respect to 148 or 150. At this moment the only passage possible for the current traverses one or other of the high resistances and the other valve and the resistance G, H becomes very great.

It is possible to annul 152 or to change the direction of it, according to the value of limitation desired.

It is obviously possible to combine arrangements of the same kind with one or several vacuum tubes with three electrodes or several filaments without departing from the spirit of this part of the invention.

All the arrangements may be applied with advantage to the primary selections or the secondary or tertiary selections made on the high frequency, the ultra-acoustic frequency or the acoustic frequency.

Figure 4 shows how the method of damping free waves may be applied to a vibrating string for the purpose of effecting the acoustic selection mechanically.

A vibrating string 160 is stretched between the points K and L. 157 and 158 represent devices capable of transforming electrical currents into mechanical vibrations (a telephone for example) and conversely. For example 157 is the transmitter and 158 the receiver, 157 being capable of being arranged at 104 (see Figure 1). 159 are dampers with blades dipping into a liquid, placed at the nodes of vibration of the string for the frequency to be selected.

According to the principle explained above, the free waves are greatly damped by the movements of the blades and the stationary wave of predetermined frequency is not so.

Figure 5 represents a method of carrying out the combination suggested in the specification of the principal invention of receiving aerials with artificial lines.

This system is characterized by a special arrangement of double artificial line, in which the series or shunt elements of each simple line are coupled together magnetically.

The two ends of a frame 161, preferably of large dimensions, are connected to two lines constituting the double line. This latter is constituted for example by an inductance capacity line composed of coils 162, coupled magnetically and arranged in series and of condensers 163, arranged two by two in shunt, the points common to the condensers being connected to earth at 167. In continuation of the direct double line is a double inverse line, composed of condensers 164 and coils 165, coupled magnetically two by two

and having their common points connected to earth. The arrow 166 indicates the direction of propagation of the wave to be received.

This double bipolar line, artificial line, owing to the magnetic couplings two by two of the simple (artificial lines) direct and inverse lines, has not the same individual frequency and resonance when the currents (which circulate in the coils of each of the poles) are in phase or not, so that if there is excitation by shock due to parasitic actions which are electrostatic or directed vertically, the oscillations will take place on a frequency which is slightly different from that to which it is tuned.

These magnetically coupled lines may also be provided with all the approved improvements for ordinary lines and serve for the primary, secondary or tertiary selections, and be placed at different points of the selecting systems.

It is convenient to have a very close coupling between the coils 162 and between the coils 165. The two coils so coupled may be made simultaneously by winding two insulated wires on one and the same cores, or by any other method.

The two last coils 165 are preferably wound in the reverse direction and coupled to the oscillating circuit 2. 3.

In certain cases, the artificial line may be constituted in whole or in part by a coil with a double winding the distributed capacity of the two wires being sufficient.

I claim:

1. A method for antiparasitic reception of sustained waves comprising the following operations: Propagating locally the sustained oscillating energy and the damped oscillating energy derived respectively from sustained waves and damped waves; producing stationary waves with the sustained waves and free waves with the damped waves; absorbing the potential or the kinetic energy of the damped waves without absorbing the energy of the sustained waves, by means of the different localization of these energies in the case of free waves and stationary waves; utilizing the energies after propagation to control the indicating apparatus.

2. A process for separating sustained oscillatory energies from damped oscillating energies consisting in propagating locally several times the sustained and damped oscillatory energies, producing each time stationary waves from the sustained waves and free waves from the damped waves, absorbing the kinetic and the potential energies of the waves at the points of minimum energy in permanent operation with stationary waves, and utilizing the energies after propagation for controlling indicating apparatus.

3. A process for separating sustained oscillatory energies from damped oscillatory energies, consisting in receiving selectively the sustained and damped electric waves, transforming the received currents into currents of secondary frequency different from the receiving frequency, propagating locally the damped and undamped secondary currents in such a way that the damped secondary currents give free waves and the sustained secondary currents give stationary waves, absorbing the kinetic and the potential energies of the waves at the points of minimum energy in permanent operation of stationary waves, and utilizing the energies after propagation for controlling indicating apparatus.

4. A process which consists in propagating locally and selectively the sustained and damped oscillatory energies derived from the sustained and damped waves, producing stationary waves from the sustained waves and free waves from the damped waves, amplifying the energies after propagation, supplying a part of this amplified energy at several points of the local wave propagating system so as to obtain a perfect stationary wave, absorbing the kinetic and potential energies of the waves at the points where these energies are minimum in permanent operation of stationary waves, and utilizing the energies after propagation for controlling indicating apparatus.

5. A process which consists in transforming the currents, arising from the electric received waves, in a succession of currents of locally determined frequency a number of which are ultra acoustical; propagating several times the undamped and damped electric oscillatory energies, of ultra-acoustical frequency, respectively arising from the sustained waves and from the damped parasitic waves; absorbing the potential and the kinetic energy of the damped waves without absorbing the energy of the sustained waves, by means of the different localization of these energies in the case of free and stationary waves; utilizing the energies after propagation for controlling indicating apparatus.

6. A process which consists in transforming the primary currents received, in currents of adjustable ultra-acoustical secondary frequency locally generated by production of beats between the received currents and a high frequency current locally generated and detection of these beats; propagating locally the undamped and damped currents of ultra-acoustical secondary frequency, respectively arising from the transformation of the damped and sustained currents received; producing stationary waves from the sustained waves and free waves from the damped waves; absorbing the potential or the kinetic energy of the damped waves without absorbing the energy of the

sustained waves by means of the different localizations of these energies in the case of free and stationary waves; utilizing the energies after propagation for controlling indicating apparatus.

7. In a receiving selective system for electric waves, a device capable of separating a short wave-train and an impulse of a long wave-train, comprising: An electric artificial line tuned to the frequency of the long wave-train, vibrating in stationary waves under the influence of the latter and having a sufficiently large number of elements for causing the short wave-train to give therein only a free wave,—and resistances in series in the artificial line at the nodes of current and in shunt at the nodes of voltage of the stationary wave.

8. In a receiving selective system in combination with radio devices, an adjustable artificial electric line tuned to the frequency of the currents to be selected, vibrating in stationary waves and provided with resistances in series in the line at the nodes of current and in shunt at the nodes of voltage of the stationary wave.

9. A device of reception with multiple selections comprising: A primary artificial line tuned to the frequency of the waves received; a local generator of high frequency; an amplifier-detector with vacuum tubes; means for coupling the latter to the primary artificial line; a secondary artificial line tuned to the secondary frequency; means for coupling this secondary artificial line to the last circuit of the amplifier of high frequency; an amplifier-selector detector; means for coupling the latter to the secondary selector, and a receiving apparatus, for instance a telephone, actuated by the current of the last circuit of this second amplifier.

10. In a receiving selective system for electric waves, a device permitting the separation of a long wave-train from a short wave-train, comprising: An artificial electric line tuned to the frequency of the long wave-train, vibrating in stationary waves under the influence of the latter and having a sufficient number of elements for causing the short wave-train to give therein only a free wave; and thermionic energy-limiters comprising two thermionic valves arranged in series in reverse directions, the said energy-limiters being in series in the artificial line at the nodes of current and in shunt at the nodes of voltage of the stationary wave.

The foregoing specification of my "Improvements in anti-parasitic selecting system" signed by me this 17th day of July, 1920.

LUCIEN LEVY.