June 17, 1947. G. V. A. GUSTAFSSON 2,422,542

ELECTRICAL ALARM SYSTEM

Filed April 11, 1944

Fig. 1.

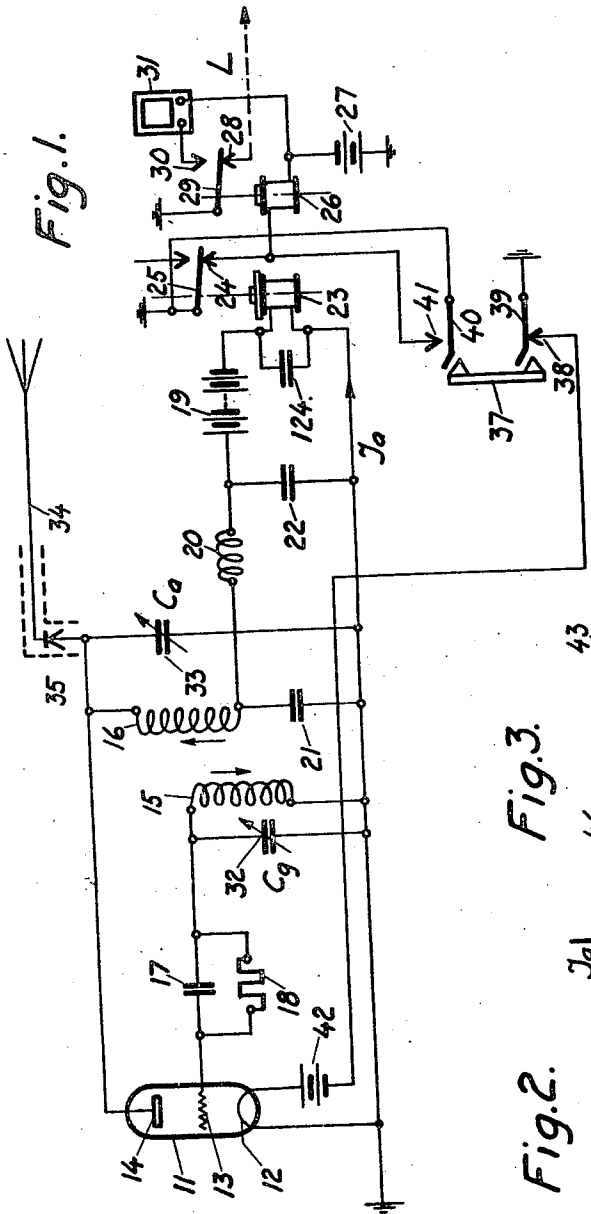


Fig. 3.

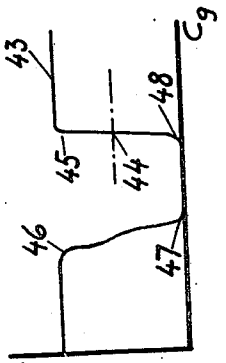
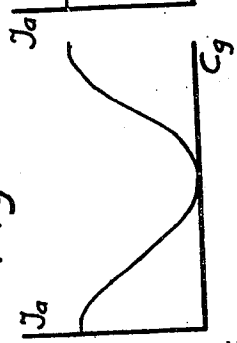


Fig. 2.



INVENTOR

Gotthard Viktor Arnold Gustafsson

By Otto Hemmel

his ATTY.

Patented June 17, 1947

2,422,542

UNITED STATES PATENT OFFICE

2,422,542

ELECTRICAL ALARM SYSTEM

Gotthard Viktor Arnold Gustafsson,
Akeshov, Sweden

Application April 11, 1944, Serial No. 530,467
In Sweden May 22, 1943

1 Claim. (Cl. 177—352)

1

The present invention relates to an electrical alarm system for the transmission of an alarm signal when a person, an animal or an object approaches an antenna in front of the object to be protected by the electrical alarm system.

The invention is particularly suitable to give a visible or audible warning when an unauthorised party enters an industrial center, office, shop, bungalow, safe or the like, or when a person is approaching a certain boundary or fence line, protected by an antenna connected to the system.

The device can also be used for switching on the lights of a show window to call the attention of people passing by or approaching the show window. Thus, an otherwise illuminated shop may be allowed to darken and the shop-keeper may save light at night.

The device can be used to count the number of persons or objects passing a certain place, or the device can be combined with a distant alarm system to ring a bell, for example, at a residence when a person passes a gate or goes through a passage.

The present invention refers to an electrical alarm system comprising in combination, an inductive coupling, which includes a vacuum tube provided with a cathode, an anode, a grid and the necessary current sources connected thereto for its operation, two oscillation circuits connected to the grid and anode, each including a single induction coil, an antenna coupled to one of the said oscillation circuits, and signal means in series with the anode circuit, said inductance coils being so connected that their mutual inductance is of a polarity to partially neutralize the coupling caused by connection to the grid and plate of the tube, and the circuits in which the coils are connected being coupled to ground and so dimensioned, tuned and loosely coupled to each other, that the characteristics of the anode current is substantially steep and continuous in the operating region, whereby undesired external disturbances fail to affect the coupling but any variation of the capacity of the antenna to ground by an object coming into the neighborhood of the antenna effects a variation in the anode current along the steep part of said characteristic to control said signal means at a predetermined variation of the capacity of the said antenna.

The invention will be better understood from the following description in connection with the accompanying drawing, in which:

Fig. 1 is a diagram showing the principal parts of the system.

Fig. 2 represents a curve showing the anode current at varying grid capacity in an ordinary known coupling, in which the inductance coils of the two oscillation circuits are connected to the grid and the anode of a tube in a so-called straight pole relation.

2

Fig. 3 represents a curve showing the anode current at varying grid capacity in a coupling according to this invention, the inductance coils being so connected that their mutual inductance is of a polarity to partially neutralize the coupling caused by connection to the grid and plate of the tube.

In Fig. 1 the vacuum tube 11 with its cathode 12, grid 13 and anode 14 is coupled to two oscillation circuits comprising the inductance coils 15 and 16. The coil 15 is coupled between ground and the grid 13, and the coil 16 is coupled between ground and the anode 14 in so-called reverse pole relation to the other coil 15. Between the grid and the grid coil there is connected a grid condenser 17 with a grid leak 18.

The anode voltage is obtained from the current source 19 over a damping coil 20, a condenser 21 of substantial capacity being coupled between the coil 16 and ground, whereby the anode circuit is made insensitive against hand capacity and high frequency oscillations are prevented from being generated in the anode circuit. By means of the condenser 22 coupled between the damping coil 20 and the current source 19 to ground the insensitiveness against hand capacity is further increased.

In the anode circuit there is coupled a relay 23 which can be made slow acting by a condenser 124 coupled parallel to the relay winding. The relay 23 is provided with a make contact 24—25 in series with the operating relay 26 and connected over the battery 27 to ground. The relay 26 is provided with make and break contacts 28—29 and 29—30 respectively. The make contact 28—29 is coupled over the line L to a distant alarm signal system or device, by means of which an alarm signal can be given in known way, when the relay 26 is deenergised, and when the relay 23 is released. At the same time a local alarm device 31 is operated.

In the grid oscillation circuit there is coupled a variable condenser 32 (C_g) to ground and parallel to the inductance coil 15, and between the anode 14 and ground there is coupled another variable condenser 33. An antenna 34 with its switch 35 is preferably connected to the anode, but an antenna can under certain conditions be coupled to the inductance coil 15 in the grid circuit instead. The switch 37 with contacts 38—39

and 40—41 is provided in order to disconnect the cathode current source 42 and in order to short circuit the contacts 24—25 to prevent an alarm signal to be released, when the alarm system is intentionally cut out of operation, for example during day time.

The alarm system operates in the following manner. By fairly loose coupling and sufficiently sharply tuned oscillating circuits there are no oscillations in the circuits. The anode current stays at its maximum value, and the relay 23 has its armature operated and its contacts 24—25 closed. The signal relay 26 also has its armature operated, and its contact 28—29 in the signal line L is closed for continuous supervision.

If, however, the resonance frequency of any of the two oscillation circuits is changed, so that the tuning becomes less sharp, oscillations will start at a previously determined capacity value, the grid collects more electrons due to the oscillations and due to the steepness of the grid current-grid potential-curve, and thus becomes more negative, so that the anode current is lowered.

The more the resonance frequencies of the two oscillation circuits are getting near to each other, the more powerful the oscillations, and the lower the anode current will be. If the frequency is further changed in the same direction, the oscillations will again decrease and the anode current will rise to its maximum value as shown in Fig. 3, the curve form of which has the shape of a resonance curve turned upside down.

A coupling with so-called straight pole relation between the inductance coils, which for example can be wound in the same direction, gives a flat anode current curve varying with the grid capacity more or less as shown in Fig. 2, where Cg represents the grid capacity and Ia the anode current.

If, however, according to the present invention, the inductance coils are coupled in reverse pole relation to each other, there is obtained a normally labile condition between the circuits, as shown in Fig. 3, so that a critical moment of release can be obtained either by variation of the grid capacity Cg or by variation of the anode capacity Ca.

When the coils are coupled in reverse pole relation, which for example can be made by winding the coils in opposite directions, there is obtained a mutual inductance of a polarity to partially neutralize the coupling caused by connection to the grid and plate of the tube, and which is contrary to the polarity obtained in known similar couplings.

If the antenna is coupled to the anode circuit, the variable capacities 32 and 33 should be so adjusted that oscillations set in at increased capacity in the antenna, whereby the oscillations should set in at an anode current and a grid capacity corresponding to the steep part 44—45 of the curve 43 shown in Fig. 3.

If the antenna is coupled to the grid coil instead, a releasing moment can be obtained, if the grid capacity is increased by increasing the capacity of the antenna to ground, so that the anode current falls from point 46 to point 47, or if the anode current rises from the point 48 to the point 45 shown on the curve 43 of Fig. 3.

Oscillations softly set in at correctly adjusted values in both circuits. The said soft setting in of the oscillations is very important, if one desires to work with a high sensitivity or with a sudden change in the anode current, because one can then be certain that oscillation really has setin before the sudden change in the anode current occurs,

and that a sudden change cannot be caused by outside accidental circumstances.

On account of the shape of the resonance curve apart from the increased sensitivity, the advantage is obtained that variations in the anode potential do not cause any major variations in the anode current. It is true that an increase of the anode voltage increases the anode current, but it also increases the oscillations in the oscillation circuits, thus causing a lowering of the anode current.

When using the device as a burglar alarm or for other purposes, where an antenna is used, said antenna can be screened near a switch 35, which by means of a special key can connect or disconnect the antenna. Such a key can, for example, be located in the neighbourhood of the front door, and when the cashier or the last responsible person has left the premises, he can by means of a special key connect the antenna or the batteries without releasing the alarm himself. When afterwards an unauthorised person approaches the unscreened part of the antenna, the alarm is unfailingly released. The switch should, of course, be located at such a place and under such conditions, that a burglar cannot easily get access to a locked box containing the switch.

The device can, for example, be used as a device for releasing a rapid fire gun controlling a passage. In such a case the antenna is located in such a manner that the gun controls the road or passage where the antenna is influenced, for example, by marching troops.

What I claim is:

An electrical alarm system comprising in combination, an inductive coupling including a vacuum tube provided with a cathode, a grid, an anode and the necessary current sources connected thereto for its operation, two oscillation circuits connected to the grid and anode, each including a single induction coil, an antenna coupled to one of the said oscillation circuits, and signal means in series with the anode circuit, said inductance coils being so connected that their mutual inductance is of a polarity to partially neutralize the coupling caused by connection to the grid and plate of the tube, circuits in which the coils are connected being coupled to ground and so dimensioned, tuned and loosely coupled to each other, that the characteristic of the anode current is substantially steep and continuous in the operating region whereby undesired external disturbances fail to affect the coupling but any variation of the capacity of the antenna to ground by an object coming into the neighborhood of the antenna effects a variation in the anode current along the steep part of said characteristic to control said signal means.

GOTTHARD VIKTOR
ARNOLD GUSTAFSSON.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
2,234,895	Cerveny et al.	Mar. 11, 1941
2,214,274	Glendenning et al.	Sept. 10, 1940
2,094,351	Draper et al.	Sept. 28, 1937

FOREIGN PATENTS

Number	Country	Date
349,496	Great Britain	May 22, 1931