

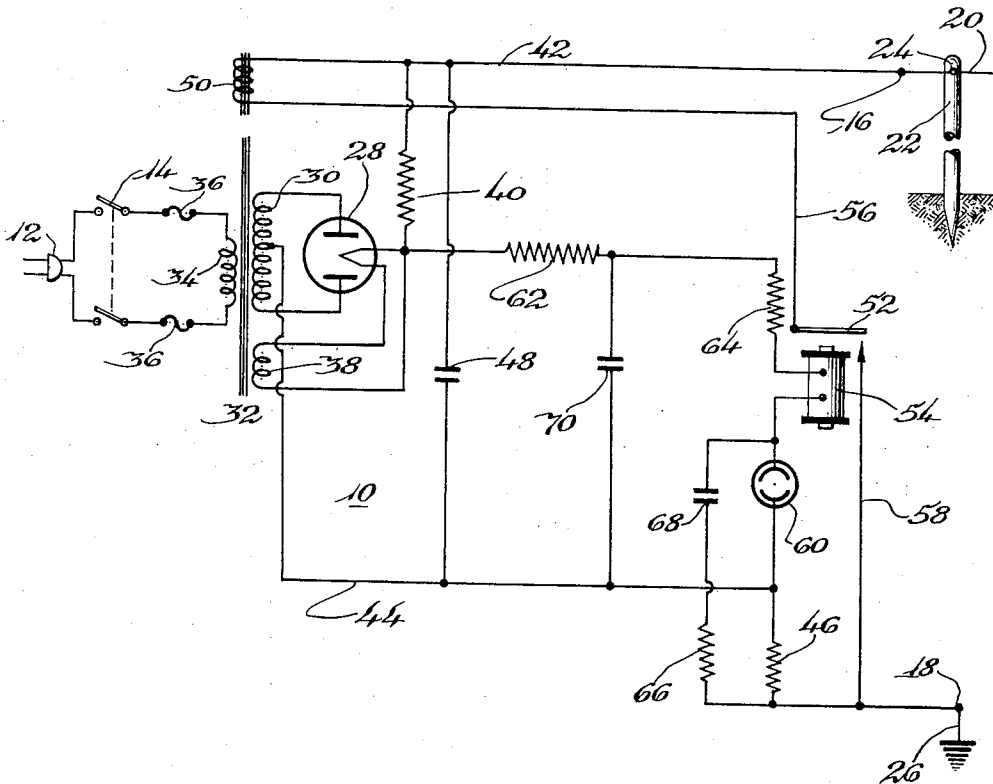
June 15, 1948.

W. F. FAGEN

2,443,232

ELECTRIC FENCE

Filed Nov. 15, 1943



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UNITED STATES PATENT OFFICE

2,443,232

ELECTRIC FENCE

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Application November 15, 1943, Serial No. 510,310

3 Claims. (Cl. 256-10)

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The present invention relates to electric fences, and particularly to apparatus for automatically energizing or charging a fence to produce a shock when an animal contacts the fence.

An object of the present invention is to provide a new and improved electric fence charging apparatus wherein a voltage is applied to the fence for a predetermined interval to produce a shock when an animal contacts the fence.

A further object of the present invention is to provide a new and improved apparatus of the character specified wherein a control voltage, preferably of low value, is normally applied to the fence and a change in voltage occurring when an animal contacts the fence is utilized to effect the operation of a relay to connect a source of voltage across the fence for a predetermined length of time.

A further object of the present invention is to provide a new and improved apparatus of the character specified wherein the voltage applied to the fence is an alternating current voltage and maximum current flow through the fence is limited to a safe value.

Other objects and advantages of the present invention will become apparent from the ensuing description, in the course of which reference is had to the accompanying drawing, the single figure of which is a diagrammatic illustration of one embodiment of the invention.

The fence charging apparatus is indicated generally by reference character 10. It is preferably adapted to be connected to alternating current voltage source through a plug connector 12 and a power switch 14. It has a pair of output terminals 16 and 18 connected to the fence which, in the illustrated embodiment, comprises a bare conductive wire 20 supported by a series of fence posts 22 (only one of which has been shown) having insulators 24 actually supporting the wire. The posts are placed in the earth in conventional manner. Terminal 16 is connected to wire 20 and terminal 18 is connected to earth through a conductor 26. It should be understood, however, that in some installations it is preferable to use two or more fence wires, one corresponding to the single wire 20 illustrated and the others to the earth connection or ground. It should be understood also that the term "fence" is not limited to fences for pastures or other enclosures for cows, horses, or other like animals, but is intended to be broad enough to include protective safeguards for houses, rooms, and the like to prevent or tend to prevent human beings from leaving or entering the premises.

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The fence charger 10 includes means providing a control voltage which is normally applied to the fence, and means providing another voltage adapted to be applied to the fence to provide a shocking impulse when an animal comes into contact with the fence. The control voltage, which is preferably a relatively low direct current voltage (say of about 300 volts) is provided by a full wave rectifier including a tube 28, the plates of which are connected to the terminals of a secondary winding 30 of a transformer 32, the primary winding 34 of which is connected to the power switch 14 through a pair of fuses 36. The tube 28 includes also a filament supplied with current from another secondary winding 38. The filament of the rectifier tube, forming the positive terminal of the control voltage, is connected through a filter resistor 40 to a conductor 42 leading to the output terminal 16, which it may be remembered is connected to the fence wire 20. The negative side of the control voltage is connected to the output terminal 18 and to ground through a conductor 44 connected to the center tap of transformer winding 30 and a control resistor 46. A filter condenser 48 is connected across conductors 42 and 44 and serves, with resistor 40, to smooth the direct current control voltage applied to the fence.

When an animal contacts the fence there is an increase in current flow across the control resistor 46 and a resulting change in voltage drop thereacross. This change in voltage is utilized to effect the connection of the shock-providing voltage source across the fence for a predetermined length of time. The voltage thus applied to the fence is supplied by a secondary winding 50, one terminal of which is connected through conductor 42 to the fence wire 20 and the other terminal of which is adapted to be connected to ground terminal 18 by a switch 52 forming part of a relay including a winding 54 adapted to be energized in a manner to be described shortly. When the switch 52 is closed, a circuit is completed across conductors 56 and 58, thereby to effect the connection of secondary winding 50 directly across the fence wire and ground. The winding 50 may be constructed to produce an open circuit voltage of the order of several thousand volts.

Current limiting means are provided in order to limit the current applied to the fence to a safe value. In the instant embodiment the current limiting means includes a loose magnetic coupling of the secondary winding 50 to the primary winding 34 of the transformer. This con-

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struction provides what is essentially a constant current transformer, i. e., the secondary winding 50 is the secondary winding of a constant current transformer. The coupling is so adjusted as to limit the maximum current to the desired value.

The relay 54 is energized in response to contact between the animal and the fence by means responsive to a change in voltage across the control resistor 46. This means includes preferably a cold cathode gas discharge tube 60 operated just below its breakdown point. Voltage is supplied to the tube from the rectifier tube through resistors 62 and 64, and the relay winding. When the flow of current through resistor 46 increases, the ground end of resistor 46 becomes more positive and this positive potential is applied to the positive terminal of the tube through a resistor 66 and a condenser 68, the purpose of which is to prevent the breakdown of the tube in response to slow changes in current flow, such as might be caused by rainfall or the like.

The relay 54 is preferably constructed to have a relatively high inductance, as about 1 henry, in order to make the tube 60 more responsive to the change in voltage across resistor 46. The inductance and resistor 64 aid in preventing the control impulse from being applied elsewhere than across the tube. Resistor 64 serves primarily to govern the time that relay 54 is maintained in its operated condition.

Once the relay is energized, it remains energized for a time that is predetermined by the values of the previously referred to resistor 62 and a condenser 70 connected between conductor 44 and the junction of resistors 62 and 64. The time interval during which the relay is energized and the shocking voltage is applied to the fence is preferably adjusted to conform to codes governing the construction and operation of apparatus of this character.

Reviewing briefly the operation of the apparatus, it is assumed first that the switch 14 has been closed to place the apparatus in operation. Under normal conditions, i. e., when there is no contact between the fence and an animal, the relay 54 is deenergized, switch 52 is opened so that the only voltage applied to the fence is the relatively low direct current control voltage, and the voltage across tube 60 is just below the breakdown voltage of the tube.

When an animal comes into contact with the fence, the flow of current through resistor 46 increases to increase the voltage drop thereacross. The change in voltage drop across resistor 46 is sufficiently rapid so that a portion of it is applied across the tube through the condenser 68 and results in the breakdown of tube 60, which, it may be remembered, is operated just below its breakdown point. When the tube breaks down the condenser 70 discharges through the resistor 64, which is a current limiting resistor, the relay winding, and tube 60. The relay remains energized for a length of time determined by the values of the condenser 70, resistor 62 through which the condenser is charged, resistor 64 and the electrical constants of relay 54. Upon energization of the relay the switch 52 is closed, and upon deenergization of the relay the switch is opened.

When the relay 54 is energized the voltage appearing across the secondary winding 50 is applied across the fence to provide the desired shocking impulse. Once the relay has been operated, i. e., closed and opened, it cannot be energized for a definite time interval controlled large-

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ly by resistor 62 and condenser 70, and furthermore, no succeeding impulse occurs unless there is a further change in current flow through resistor 46, as by a second animal coming into contact with the fence or the first animal again coming into contact with the fence after having disengaged itself therefrom.

While the condenser 48 is connected to the fence, it does not produce any substantial shocking effect when the fence is contacted by an animal because of the magnitude of control resistor 46, which may have a value of about .1 megohm.

While a preferred embodiment of the invention has been described in detail, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. Apparatus for energizing a fence comprising a conductive wire adapted to complete a circuit through the body of an animal contacting the wire, including in combination, a source of voltage normally disconnected from the fence circuit, means including an electron tube and a relay having a winding in series with said tube controlled in response to contact between an animal and said wire for connecting said voltage source to the fence circuit, and means including a condenser adapted to discharge through said tube and relay winding for maintaining said connection for a predetermined length of time.

2. Apparatus for energizing a fence comprising a conductive wire adapted to complete a circuit through the body of an animal contacting the wire, including in combination, a high voltage source of voltage normally disconnected from the fence circuit, means supplying said fence with a low control voltage, means including a low voltage source of voltage, an electron tube associated with said second low voltage source and a relay having a winding in series with said tube controlled in response to a change in current flow through the fence wire occurring upon contact between an animal and said wire for connecting said high voltage source to the fence circuit, and means including a condenser adapted to discharge through said tube and relay winding for maintaining said connection for a predetermined length of time.

3. Apparatus for energizing a fence comprising a conductive wire adapted to complete a circuit through the body of an animal contacting the wire, including in combination, a high voltage source of voltage normally disconnected from the fence circuit, means for continuously supplying said fence with a low control voltage, means including a low voltage source of voltage, a cold cathode gas tube connected to said low voltage source and normally supplied with a voltage slightly below its breakdown voltage and a relay having a winding in series with said tube controlled in response to a change in current flow through the fence wire occurring upon contact between an animal and said wire for connecting said high voltage source to the fence circuit, said last mentioned means including means for effecting breakdown of said tube, and means including a condenser in circuit with said relay and tube and normally charged by said low voltage source and adapted to discharge through said tube and relay winding upon breakdown of

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the tube for maintaining said connection for a predetermined length of time.

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Certificate of Correction

Patent No. 2,443,232.

June 15, 1948.

WILLIAM F. FAGEN

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Column 1, line 24, for "sale" read *safe*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 31st day of August, A. D. 1948.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.

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