July 5, 1966 A. M. SENKEWICH 3,258,872

VERMIN KILLER (ELECTRIC GUN)

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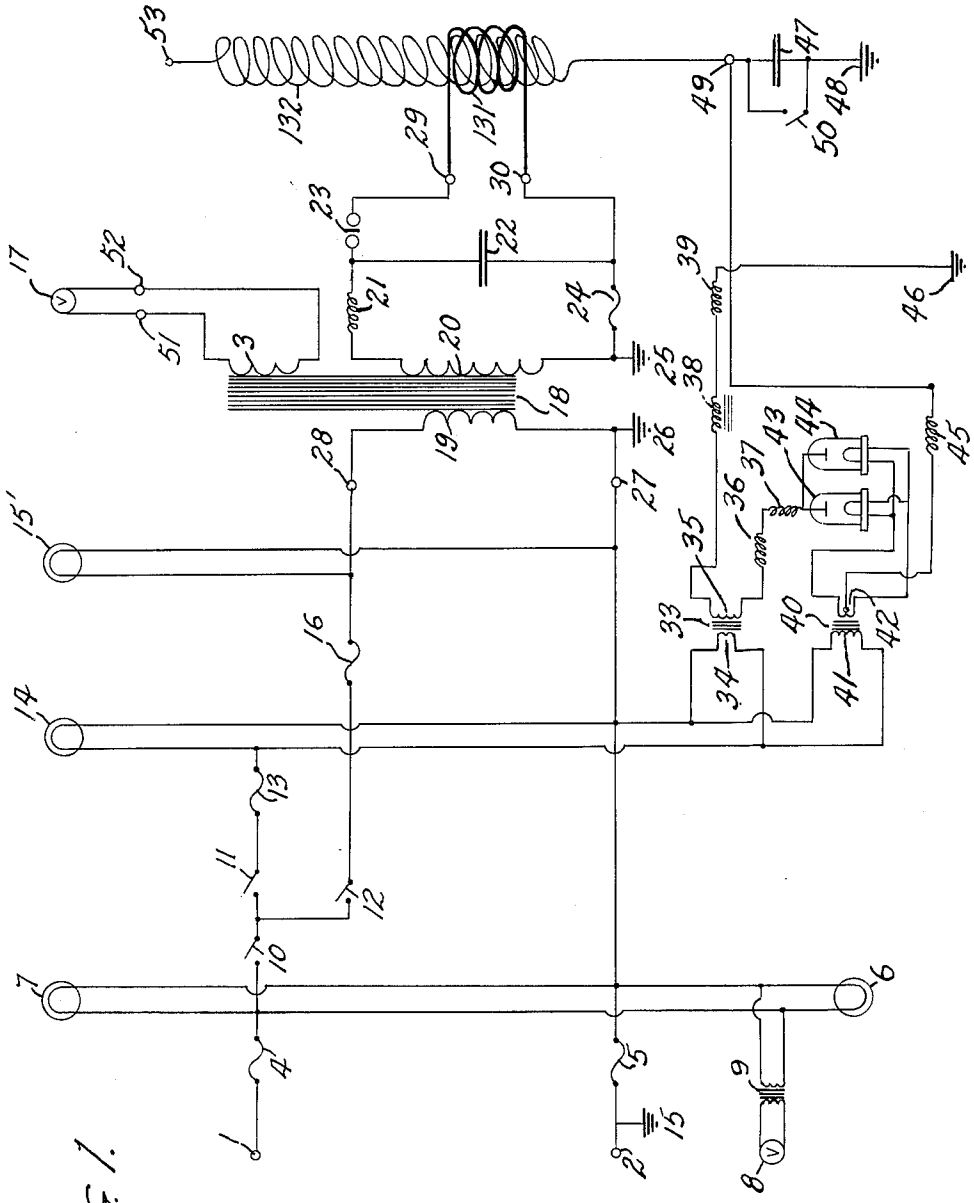


FIG. 1.

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FIG. 3.

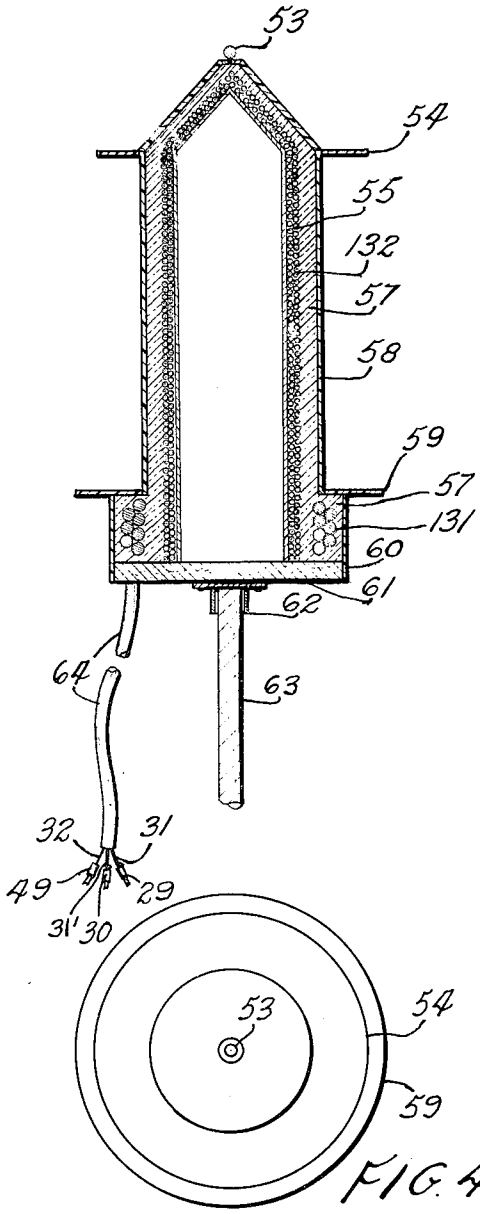
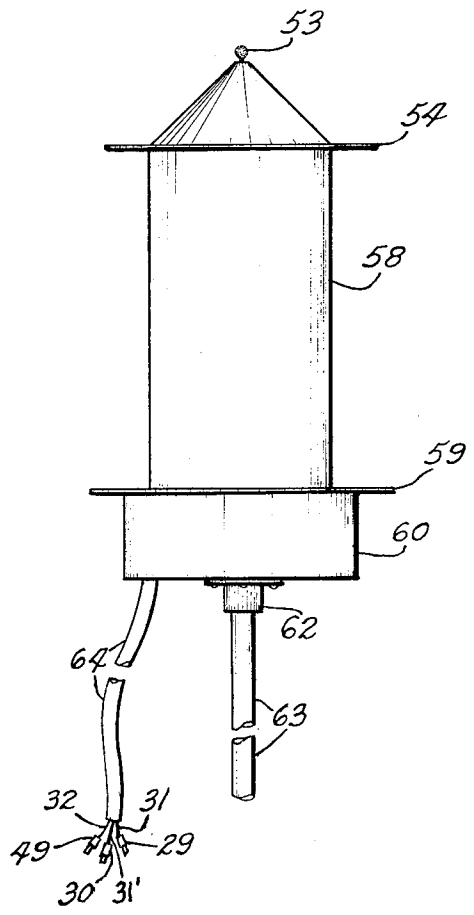


FIG. 4.

FIG. 2.



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FIG. 7.

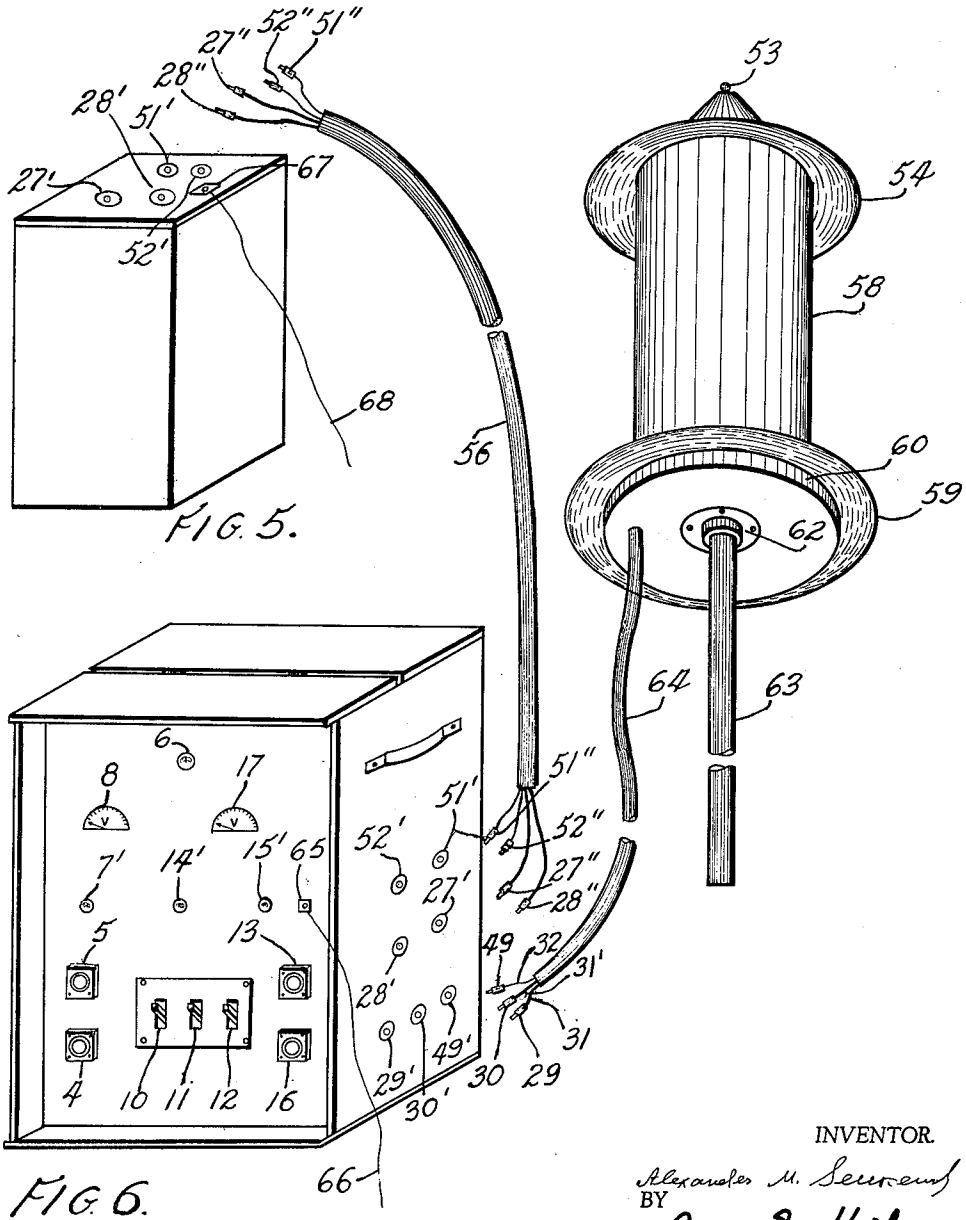


FIG. 5.

FIG. 6.

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3,258,872

VERMIN KILLER (ELECTRIC GUN)

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Filed Feb. 21, 1964, Ser. No. 346,526
4 Claims. (Cl. 43—132)

This application is a continuation-in-part of applicant's copending application Serial No. 202,199, filed June 13, 1962, entitled "Electrical Termites (Insect) Killer," now abandoned in view of this application presenting the invention in better form.

An object of this invention is to kill some types of small invertebrate vermin.

Another object of this invention is to use for the extermination of such vermin a stream of single sign charges expedited by a simultaneous discharge of high voltage, high frequency, oscillating current.

With the foregoing and other objects in view, as will appear from a reading of the following specification and claims, the invention resides in the novel arrangement and combination of parts and in the details of construction and process of manufacture hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention may be made within the scope of what is claimed without departing from the spirit of the invention. It will be further understood that my invention is susceptible of embodiment in many and various forms, one of which is illustrated in the accompanying drawing, and that the structural details herein set forth may be varied to suit particular purposes and still remain within my inventive concept.

FIG. 1 illustrates one form the electrical system may take.

FIG. 2 is a side elevation of the electric gun.

FIG. 3 is a vertical cross-sectional view of FIG. 2.

FIG. 4 is a top plan view of the gun.

FIG. 5 illustrates the housing for the transformer used in the first circuit.

FIG. 6 shows the housing for the remainder of the circuits.

FIG. 7 is another view of electric gun.

This invention results from the following observations by applicant:

(1) A linear coductor, such as, a wire, irrespective of whether straight or coiled, connected at one end with the pole of an electric generator of direct current, in the range of, for example, 5,000 to 6,000 volts, and free at its other end, becomes charged but its charges are dissipated into the air at an extremely slow rate.

(2) If the same linear conductor is, at the same time, exposed to induced electric oscillations of high frequency, and the latter cause a high voltage discharge from the open end of the conductor, the charges of the direct current brought to the conductor from a generator or rectifier join in the discharge and thereby create a direct current through the air and also through wood, brick, marble, concrete and even glass.

(3) The presence of this direct current is noticeable for a certain distance beyond the open end of that linear conductor either by its effect on a milli-ammeter, or by its killing action upon insects that come into the cone of the radiated current as long as the density of the radiated current in the area of the cone does not become too low.

THE INVENTION

Applicant reduced the above observations to a practical form useful in destroying all kinds of small invertebrate vermin by building an electric resonator generally

of the usual type, and sending a high frequency current in the range of, for example, 5,000 to 6,000 volts through its primary coil. A current of a much higher voltage and the same high frequency of oscillations was induced in the resonator's secondary coil. One end of this secondary coil was connected with one pole of a generator of direct current in the range of, for example, 5,000 to 6,000 volts, or with one pole of an electronic rectifying hook-up.

With a total power input of 1.5 k.v.a. into the whole apparatus, i.e., the resonator and the auxiliary system of fixtures, the inventor obtained a radiation of electric charges of a constant sign (plus or minus as desired), which radiation is noticeable in free air by its killing action upon crawling (like cockroaches) or flying (like wasps) insects for a distance of approximately twenty inches from the radiating end of the resonator's secondary coil. An obstacle like a wooden wall six inches thick covered with stucco on the outer side reduces the illing distance to approximately 7 to 9 inches in a circle of twelve to sixteen inches in diameter.

The figures above, i.e., distances, voltages, etc., are merely illustrative. It might well be possible to use currents of less or much more than five to six thousand volts, and the power input might be raised, limited only as far as the convenience of handling the relatively cumbersome apparatus would permit.

The apparatus can be used wherever the usual 110 volt lighting current is available providing the wiring can stand the necessary amperage.

The operation of clearing the wooden walls of a house from termites proceeds as follows: The box or boxes carrying the auxiliary equipment which produces the high frequency electric oscillations, and the rectified pulsating current of 5,000 to 6,000 volts is set up upon a small platform movable on wheels. It is attached to the source of alternating current and grounded at the necessary points. This platform is moved forth and back by a helper following the directions of the operator so that the cable carrying two currents to the resonator will not be fouled.

The operator takes the handle of the resonator, throws in the necessary switches, observes the electric signal lamps showing that all circuits are in working order, and approaches one of the lower corners of the wall that is to be treated. He points the radiating head of the resonator (which latter shall from now on be called the electric gun), at that corner, keeping the radiating head one to two inches away from the wall, waits two to three seconds, and moves toward the other corner stopping for two to three seconds every six inches or so, but keeping the electric gun continuously aimed toward the surface of the wall.

After arriving at the opposite corner of the wall, the operator raises the aim of the electric gun about 6 inches and walks back, playing the electric stream upon the points of an imaginary six inch higher horizontal line until he comes to the starting corner. From there he walks again to the second corner raising the aim of his electric gun by another six inches, and repeats these operations until the wall has been covered.

Upon reaching the maximum height convenient to the stature of the operator, the operator continues his work higher up by mounting a ladder, for example, movable upon a pair of wheels along the ground and another pair of wheels gripping the cornice of the wall or in some other suitable manner.

In this manner one wall of a two-story house, twenty feet wide and twenty-two feet high, is cleaned of live termites within one and a quarter hours. A proper mechanical system, and an apparatus of three k.v.a. should do this work in thirty to forty minutes.

DESCRIPTION OF THE APPARATUS

The main part, and the one to which the inventor attaches special importance is the resonator, i.e., the electric gun. It is shown under FIGS. 2, 3, 4 and 7.

Referring in detail to the drawings, and particularly to FIG. 2, numeral **53** indicates a radiating head fitted to the open end of the resonator's secondary coil, **54** and **59** are ring-like disks of insulating material protecting the instrument from backwashes of the discharge from the radiating head, **58** is the outer shell of insulating material enclosing the space of the secondary coil, **60** is the outer shell of insulating material enclosing the space of the primary coil, **62** is the metallic socket holding the handle of the electric gun, **63** is the handle (wooden or plastic), **64** is the tubular, heavy rubber shell of the cable carrying the three ends **31**, **31'** and **32** of the electric gun's primary and secondary coils, **29** and **30** are connectors of the coil ends **31** and **31'**, while **49** is the connector for coil end **32**.

Referring to FIG. 3, **131** indicates the primary coil of the electric gun, **132** is the secondary coil, **57** is the space enclosing the primary coil and the secondary coil of the electric gun and filled with a high insulating material poured while in the molten state, **61** is the wooden base of the gun.

The purpose of the wiring hook-up as illustrated in FIGS. 1, 5 and 6 is to supply the primary coil of the electric gun with a high frequency oscillating current of a voltage of the order of 5,000 to 6,000 volts or thereabouts, and the secondary coil of the gun with a current of rectified charges, of a voltage of the same order of 5,000 to 6,000 volts. It is drawn along lines well known to the art, and thus calls merely for a description but for no discussion of theory.

Alternating current, having phase and ground, is switched to contacts **1** and **2** from a 120 v. line. The current is grounded to contact **2** at point **15**. The voltage of this current is measured by voltmeter **8** through transformer **9**. After being switched on the current passes through safety fuses **4** and **5** and is served to the distributing wires of the apparatus by main switch **10**. At this, signal lamps **6** and **7** indicate whether safety fuses **4** and **5** are in working order.

By switching on switch **12**, the current passing through safety fuse **16**, at contact **28** closes the circuit of primary coil **19** of step-up transformer **18**. Signal lamp **15** will show that primary coil **19** of transformer **18** is active under current. One end of this primary coil is grounded at point **26**. This grounding, and also the grounding of secondary coil **20**, serves for the protection of the transformer from high frequency currents.

Spark gap **23** consists of two electrodes placed very closely to each other with one or several intervals. Spark gap **23**, together with condenser **22** and primary coil **31** of the high frequency transformer goes into the composition of the so-called high frequency circuit. Condenser **22** receives a charge with each semi-oscillation of the cycle of the high voltage alternating current from secondary coil **20** of high voltage transformer **18**. When the voltage of this charge reaches maximum, then a spark appears in spark gap **23**. Through this spark and primary coil **131** of the high frequency transformer occurs the damped wave discharge of condenser **22**. Such a damped wave discharge of condenser **22**, passing through coil **131**, creates in it variable magnetic fields which induce high frequency current in secondary coil **132**. The cycle indicated above will repeat with every semi-oscillation of the alternating current charging condenser **22**. One end of secondary coil **132**, through condenser **47**, is grounded at point **48**, and from the second end, at point **53**, occurs the spark discharge of the damped waves of high frequency high voltage current.

In order for the spark discharge to be realized, there must be present resonance of currents, which is possible

at the identicality of the oscillations of currents in secondary coil **132** and primary coil **131**. In the feeder circuit of condenser **22** there is, without a core, choke coil **21**, the task of which is to protect secondary coil **20** of transformer **18** from high frequency current. Winding **3** serves for the feeding of voltmeter **17** showing the voltage of transformer **18**.

By the turning on of switch **11**, alternating current from the line, through safety fuse **13**, enters into sep-up transformer **33** and step down transformer **40**. Signal lamp **14** shows that safety device **13** is in working order and that transformers **33** and **40** are energized. Transformer **40**, a step-down transformer, has voltage of 1.5 volts and serves to heat the two vacuum tube rectifiers **43** and **44**, connected to each other in parallel. From the middle turn of secondary coil **42** of transformer **40** there is a lead-off which carries the pulsating current through choke coil **45** to contact **49**, to which is also joined the beginning end of secondary coil **132** of the high frequency transformer and condenser **47**.

Transformer **33** serves for the raising of the voltage of the alternating current from the line. From the secondary coil **35** of which transformer, high voltage alternating current through choke coils **36** and **37** enters the anodes of vacuum tube rectifiers **43** and **44** and subequently is rectified into direct current. Coke coils **36**, **37** and **45** serves to protect the vacuum tube rectifiers from high frequency currents from secondary coil **132** of the high frequency transformer. The second end of secondary coil **35** of transformer **33** has a choke coil with iron core **38** and choke coil **39** without yoke. Choke coil **38**, together with condenser **47**, serves as a filter evening out the pulsations of direct current from vacuum tube rectifiers **43** and **44**. Choke coil **39** serves as a protector of choke coil **38** from high frequency currents. After choke coil **39**, the wire carrying the potential minus of the direct current is grounded at point **46**.

In this way, the plus of the high voltage current turned on at point **49** goes along secondary coil **132**, in which at this same time a high frequency high voltage resonant current is created. This direct current subsequently, along with the spark discharge of the damped waves of high frequency high voltage resonant current goes, from tip **53**, to the ground through a termite or other irradiated vermin and thus closes the circular circuit.

The scheme shown in FIG. 1 embraces three circuits: one results in sending to the primary coil of the resonator an alternating current of high frequency, but a modest voltage of about 5,000 to 6,000 volts; the second results in sending into the secondary coil of the resonator a steady stream of pulsating rectified charges and of the same order of voltage as the first circuit, thus turning the ordinary resonator into an electric gun capable of killing and exterminating many kinds of invertebrate vermin which demage wooden structures, spoil cereal grains, and ordinary beans, soy beans, coffee beans, cocoa beans, etc.; the third circuit is for the purpose of properly heating the filament of the Kenotrons used in the second circuit.

The first circuit is composed of **1**, **2** terminals of the primary source of alternating current supplied by ordinary lighting or power outlets; **4** and **5**, safety fuses; **15**, ground connection; **10**, main switch; **12**, the switch of the first circuit; **16**, safety fuse; **27** and **28**, connectors to the primary coil of the transformer; **19**, primary coil of the step-up transformer; **18**, the transformer's iron core; **20**, secondary coil of the transformer (yielding a voltage of 5,000 to 6,000 volts); **21**, choke coil; **22**, condenser; **23**, spark gap; **29**, **30**, connectors to the primary coil of the resonator; **131**, primary coil of the resonator; **24**, safety fuse; **25**, **26**, grounds; **132**, secondary coil of the resonator; **53**, the radiating head of the secondary coil; numeral **3** is an auxiliary part coil of the secondary coil of the above transformer **20** and serves to measure the full voltage by computation from the readings of the voltmeter **17**, while **51** and **52** are terminals of the voltmeter.

The second circuit or rectifying circiut is composed of **11**, switch connecting this circuit to the main line; **13**, safety fuse; **33**, core of the smaller step-up transformer; **34**, primary, **35**, secondary (step-up) coil of this transformer; **38**, main chock coil with an iron core; **36**, **37**, **39** core-less chokes; **43**, **44**, Kenotrons; **46**, ground of this second circuit; **49**, connector to the secondary coil of the resonator and to the filtering condensers; **47**, **50**, discharge switch.

The third circuit, i.e., for heating the filaments of the Kenotrons, composed of **41**, the primary coil of the step-down transformer; **40**, this transformer's core; **42**, the secondary (step-down) coil and the sliding contact (to control the amperage); **45**, choke coil.

Also, further auxiliaries are as follows: **6**, electric light illuminating the switchboard of the auxiliary set-up; **7**, **14**, **15'**, electric lamps showing whether the three circuits are working; **8**, voltmeter of the main line; and **9**, its step-down transformer.

Referring to FIG. 5, the housing containing the transformer used in the first circuit, **27''** and **28''** are plugs sockets **27'** and **28'** and plugs connecting the primary coil of this transformer to the main line; **51'** and **52'**, sockets, and **51''** and **52''** plugs to the voltmeter showing the voltage in the secondary coil of this transformer; **67**, ground connection; **68**, grounding wire; **56**, cable carrying wires from **27''** and **28''** and **51''**, **52''** from this transformer to the box carrying the balance of the auxiliary set-up and contained in the box in FIG. 6.

FIG. 6 illustrates electric light **6** illuminating the switchboard; **7**, **14**, **15'**, signal lights showing that the three circuits are in working shape; **8**, voltmeter for the supply line of the electric current; **17**, voltmeter measuring the voltage developed in the secondary coil of the transformer in the first circuit; **10'**, **11'**, **12'**, switches; **4'**, **5'**, **13'**, **16'**, safety fuses; **27'**, **28'** input sockets to the primary coils of the transformer in the first circuit; **51'**, **52'**, sockets to the voltmeter of that transformer's secondary coil; **29'**, **30'**, connectors to the primary coil of the electric gun; **49'**, connector for bringing rectified current to the secondary coil of the electric gun; **65**, plug-in for the ground; **66**, grounding wire.

It is thus seen that applicant has developed a new and unobvious device for expeditiously and effectively eradicating vermin without the necessity of contacting either the insects themselves or their food with poisonous chemicals or solutions.

What is claimed is:

1. An apparatus for killing and exterminating various invertebrate vermin damaging wooden structures and granular food products, consisting of a high frequency transformer having primary and secondary coils, means for feeding high frequency current of high voltage to said primary coil to produce high frequency current in said secondary coil, and means for charging the secondary coil from a source of a direct current of high voltage, and means for discharging said high frequency and direct currents simultaneously in order to produce a continuous stream of electric charges killing the vermin.

2. An apparatus as set forth in claim **1** wherein the high voltage is in the range of 5,000 to 6,000 volts.

3. An apparatus for killing insects comprising a radiating head, means for providing an oscillating first discharge of high frequency, high voltage alternating current from said head, and means for providing simultaneously with said first discharge a second discharge of high voltage direct current from said head.

4. An apparatus for killing and exterminating various invertebrate vermin damaging wooden structures and granular food products, consisting of a high frequency transformer having primary and secondary coils, means for feeding high frequency current of high voltage to said primary coil to produce high frequency current in said secondary coil, and means for charging the secondary coil from a source of a rectified current of high voltage, and means for discharging said high frequency and direct currents simultaneously in order to produce a continuous stream of electric charges killing the vermin.

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