

Nov. 24, 1936.

D. D. KNOWLES

2,062,269

PROTECTIVE SYSTEM

Filed May 3, 1928

Fig. 1.

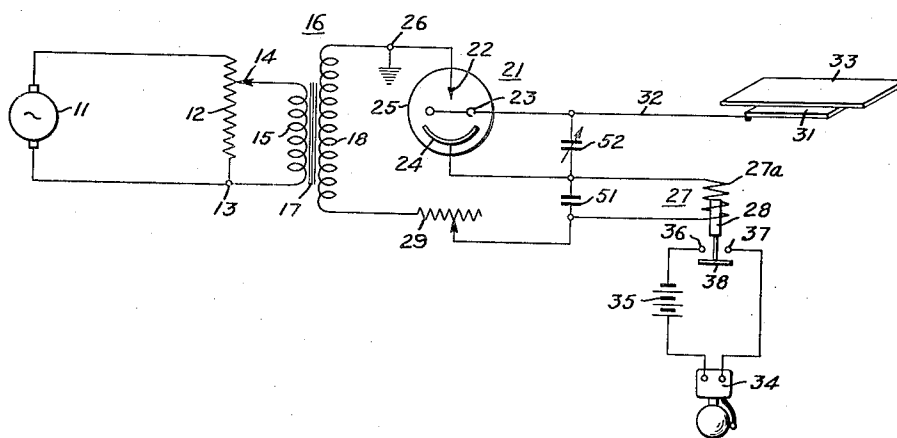
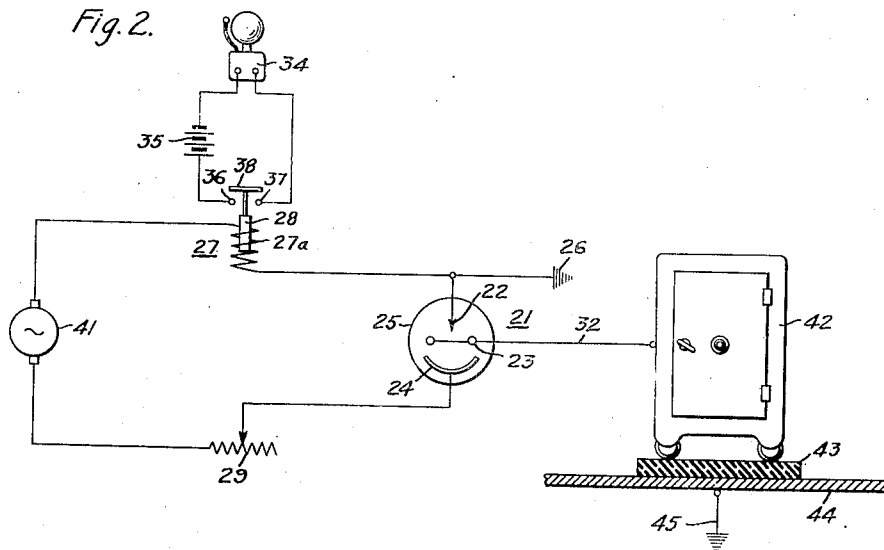


Fig. 2.



INVENTOR

Dewey D. Knowles.

BY

Wesley L. Parr
ATTORNEY

UNITED STATES PATENT OFFICE

2,062,269

PROTECTIVE SYSTEM

Dewey D. Knowles, Wilkinsburg, Pa.

Application May 3, 1928, Serial No. 274,743

5 Claims. (Cl. 177—314)

My invention relates to electrical systems and particularly to electrical alarm systems.

An object of my invention is to provide a relatively simple and highly sensitive alarm system.

Another object of my invention is to provide a highly efficient, highly sensitive alarm system that shall be dependent upon the use of grid glow tubes.

Another object of my invention is to provide an electrical system having an output circuit that shall be operable through the agency of a plural-electrode electrical-discharge device, which device is controlled by a transitory electrical condition of one of its electrodes.

In practicing my invention, I provide an output circuit which may include any kind of an electrically-controllable element, a relay for controlling the circuit and an electrical-discharge device having a plurality of electrodes therein including a control electrode to which is electrically connected an electrically insulated metal member.

In the single sheet of drawings,

Figure 1 is a diagram of connections illustrating my invention, and,

Fig. 2 is a diagram of connections illustrating a modified form and connection of my invention.

Referring more particularly to Fig. 1 of the drawing, I have there illustrated a suitable source of alternating-current potential 11, embodying a generator which is here shown as energizing a member 12 which may be either an auto-transformer or a resistor. The respective fixed and movable terminals 13 and 14 associated with the element 12, may be connected to the primary winding 15 of a suitable transformer 16 comprising, in addition to the primary winding 15, a core 17 and a secondary winding 18. The object of using the transformer 16 is that it permits of using the ordinary 110 volt circuit as a source of supply, in which case the element 12 may be omitted.

A grid glow tube 21 of the type disclosed and claimed in my earlier application Serial No. 149,240, filed Nov. 19, 1926, of which this is a continuation in part, is provided with, and comprises, a plurality of unexcitable electrodes 22, 23 and 24 located within a casing 25, all as described in the above mentioned application. The electrode 22 constitutes the anode, the electrode 24 constitutes the cathode, and the electrode 23 constitutes the control electrode. It has been the practice in discussing the tube 21 to refer to the anode 22 and the cathode 24 as the "principal electrodes" of the tube. By an unexcitable principal elec-

trode I mean an electrode of a discharge device which is not, in any operation of the discharge device in the system disclosed, excited by an external power source to emit electrons.

A ground connection 26 is provided for the anode 22 for a purpose which will be hereinafter set forth.

A relay 27, having a coil 27a and a core 28, is provided, one terminal of the coil 27a being connected to the cathode 24, while the other terminal is connected to one terminal of an adjustable rheostat 29. One terminal of the secondary winding 18 is connected to the other terminal of rheostat 29, while the second terminal of the secondary winding is connected to electrode 22 and is, therefore, grounded. While I have illustrated a specific kind of grounding connection, it is not necessary that such be employed, as I may connect one terminal of the secondary winding 18 to the core member 17 and I have found that the sensitivity of the grid glow tube 21 and of the entire system, in fact, is so high that even this form of ground connection will permit the system to operate in the desired manner.

The control electrode 23 is connected to a metal member 31 by a conductor 32 which is thoroughly insulated from ground. The metal member 31 may be of any suitable or desired shape, such as a thin sheet of metal or a metal plate or a metal member of any shape or size, the only requirement being that the member 31 and the conductor 32 shall be very thoroughly insulated from ground.

As I have applied a circuit of this kind to the protection of jewelers' show cases, I have elected to show the member 31 as located immediately below a glass cover 33, here shown in part only, to which the metal 31 is suitably secured so that it may be thoroughly insulated from ground.

The relay 27 controls an output or work circuit which may be of any kind whatsoever, or any actuable means controllable by an electric current and is here shown as comprising an audible signal, such as a bell 34, and a source of electric potential 35. The bell and the battery 35 are connected in series-circuit relation and to the fixed contact members 36 and 37 which are adapted to be engaged by contact-bridging member 38 operatively associated with the core 28.

Referring more particularly to Fig. 2 of the drawing, I have there illustrated a slightly different application of my invention, more particularly applied to the protection of a metal safe. A generator 41 energizes a grid glow tube 21, sub-

stantially the same as hereinbefore described in connection with Fig. 1, the coil 27a of a relay 27 and the adjustable resistance 29 being connected in the circuit in substantially the same manner as hereinbefore described. While I have omitted the member 12 and the transformer 16, it is obvious that these members could be used in the circuit and still obtain the same results.

The anode 22 is grounded, as at 26, and the control electrode 23 is connected to a safe 42 which is mounted on a relatively heavy slab of electric-insulating material 43 which is, in turn, mounted on a suitable base plate 44 of metal or of any other conducting material and suitably grounded, as at 45.

A bell 34, a battery 35 and the connections between these and the fixed contact members 36 and 37 of the relay 27 are the same as hereinbefore described.

The general theory of operation of the grid glow tube 21 has been set forth in detail in my early application, and I do not, therefore, consider it necessary to go into great detail. However, briefly, the action of the grid glow tube is that a small rectified current impulse will traverse it when a sufficiently high voltage is impressed upon the terminals thereof at each half wave thereof which is positive with respect to the anode 22. These small current impulses continue until a blocking charge is generated on the control electrode 23, after which no further current flow will occur during normal operation. This normal operation is intended to cover the condition of a substantially constant energization of the tube and the maintenance of the member 31 and the conductor 32 completely insulated from ground, this applying also to the electrode 23. If now, a person should momentarily approach the member 31, the capacitance of that person's body would be sufficient to disturb the electrical condition of equilibrium heretofore existing and cause a reduction in the potential or a reduction in the blocking charge of the control electrode 23, whereby a series of small current impulses would be permitted to flow through the tube and, therefore, through the coil 26 of the relay 27. As these current impulses are each relatively very minute, it might happen that they would not sufficiently energize the coil 26 to raise the core 28, or that the relay would open after each impulse, thereby causing chattering. In order to make sure that proper and continuous energization of the relay coil shall occur, I may provide a condenser 51, the terminals of which are connected to the terminals of the relay coil 27a. This condenser will have the effect of accumulating a charge thereon which, when high enough, will discharge through the coil 27a and insure its proper operation.

In order to aid in the quick operation of the relay 27, it is desirable to make all of the parts relatively light and sensitive to current flow.

A second condenser 52, which may be made adjustable, is provided and connected between the control electrode and the cathode. This condenser, when made adjustable and used in combination with the condenser 51, will permit of adjusting the sensitivity of operation of the device.

I have found that, when a system of the kind shown in Fig. 1, is properly insulated, it will operate as a very sensitive alarm system, as I have found by the following experiment. A plurality of pieces of silver-ware were laid upon a glass plate shown in the diagram as element 33, the other parts of the system being substantially as

shown in that figure. Upon energizing the system and permitting it to reach its normal condition of stable equilibrium, it was impossible for any one to try to touch one of the pieces of silver without causing the alarm bell to ring. It may be noted, therefore, that it is not necessary to completely ground the element 31 and, therefore, the control electrode 23, but that a transitory change in an electrical condition of a portion of the system, and more particularly, a variation in the capacitance of an element connected to the control electrode will cause the system to operate in the desired manner. The same remarks will apply to the system shown in Fig. 2, wherein it is desired to protect a safe, the only requirement being that the safe be mounted on means for electrically insulating it from ground. The capacitance of the body of any one approaching the safe within reasonable distance will so disturb the capacitance of the safe, the conductor 32 connecting it to the control electrode 23 and therefore of the control electrode 23, as to permit the tube to operate, whereby the relay coil is energized.

While I have shown this system applied to alarm purposes only, I do not wish to be limited thereto, as the output circuit may, as has already been set forth, be any type of work circuit so long as it may be electrically controlled by the relay 27. Under certain conditions, it may not even be necessary to provide a relay and the work circuit may be included in the circuit of the electrodes of the grid glow tube, although, for the best results, I have found it desirable to use a relay.

I have, for instance, used substantially this circuit and, more particularly, the grid glow tube, when substantially all the elements except the sources of electric potential were located within a small box and the wave of an operator's hand moved over the box and over an element corresponding to element 31, would operate to cause a current impulse to be sent out through a circuit controlled by the relay 27 which started a large electric motor.

In the claims, the expression "a unitary source of electrical energy having two poles and impedance connections therewith for impressing potentials between said principal electrodes and between said control electrode and at least one of said principal electrodes" or its equivalent, is used. The words "impedance connections" in this expression mean connections incorporating ordinary impedances and not sources of electrical energy. However, it is understood that apparatus in which one or more sources is incorporated in the connections without performing an essential function lies within the scope of my invention and the claims of this patent.

Various modifications may be made in the system embodying my invention without departing from the spirit and scope thereof and I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art or are set forth in the appended claims.

I claim as my invention:

1. A translating system comprising an electric discharge device of the grid-glow tube type containing a gaseous atmosphere and having a control electrode and a plurality of unexcitable principal electrodes, a unitary source of electrical energy having two poles and impedance connections therewith for impressing potentials between said principal electrodes and between said control electrode and at least one of said principal electrodes to maintain said device in one of its conditions

of operation, means coupled to said control electrode and responsive to the presence of a foreign body in the region thereof to vary the potential between said control electrode and said one principal electrode thereby to vary the condition of operation of said device and means to respond to said variation in the condition of said device to indicate the presence of said foreign body.

2. A translating system comprising an electric discharge device of the grid-glow tube type containing a gaseous atmosphere and having a control electrode and a plurality of unexcitable principal electrodes, a unitary source of electrical power having two poles and impedance connections therewith for coupling said source between said principal electrodes to impress a potential therebetween, means, including an impedance coupled between said control electrode and at least one of said principal electrodes and to said unitary power source, for impressing a potential between said control electrode and the last said principal electrode that cooperates with the potential impressed between said principal electrodes to maintain said discharge device in one of its conditions of operation and means coupled to said control electrode and responsive to a foreign element to be detected in the region thereof for varying the potential impressed between said control electrode and another of said principal electrodes to vary the condition of operation of said device.

3. A translating system comprising an electric discharge device of the grid-glow tube type containing a gaseous atmosphere and having a control electrode and a plurality of unexcitable principal electrodes, a unitary source of electrical energy having two poles and impedance connections therewith for impressing potentials between said principal electrodes and between said control electrode and at least one of said principal electrodes to maintain said device in one of its conditions of operation, means coupled to said control electrode and responsive to the presence of a foreign body in the region thereof to vary the

magnitude of the potential between said control electrode and said one principal electrode, while the frequency of said potential remains independent of the presence or absence of said foreign body, thereby to vary the condition of operation of said device and means to respond to the variation in the condition of operation of said device to indicate the presence of said foreign body.

4. Translating apparatus comprising an electric discharge device of the grid-glow tube type containing a gaseous atmosphere and having a control electrode and a plurality of unexcitable principal electrodes, a unitary source having two poles and impedance connections therewith for impressing a potential between said principal electrodes, a capacitor connected between said control electrode and one of said principal electrodes, a conducting plate of extended area insulated from ground, means for coupling the plate to said control electrode, and means for grounding the other of said principal electrodes whereby the presence of a foreign body in the region of the conducting plate varies the capacity between it and ground for changing the condition of operation of said device.

5. A translating system comprising an electric discharge device of the grid-glow tube type containing a gaseous atmosphere and having a control electrode and a plurality of unexcited principal electrodes, a unitary source of electrical energy having two poles and impedance connections between said poles and said principal electrodes and between said control electrode and at least one of said principal electrodes for impressing potentials between said principal electrodes and between said control electrode and said principal electrodes to maintain said device in one of its conditions of operation, and means coupled to said control electrode and responsive to the presence of a foreign body in the region thereof to vary the potential between said control electrode and at least one of said principal electrodes thereby to vary the condition of operation of said device.

DEWEY D. KNOWLES.