FIG. I

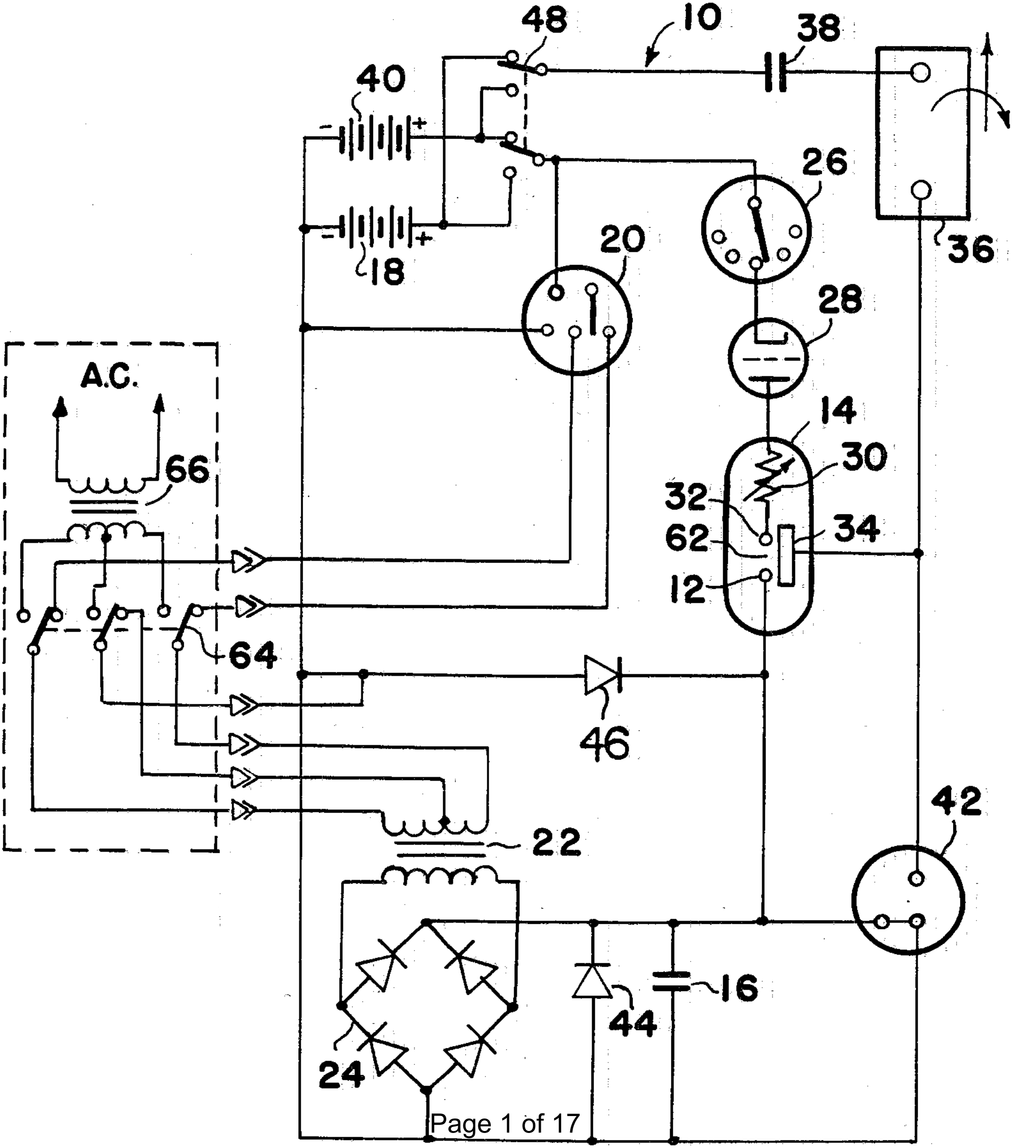


FIG. 2

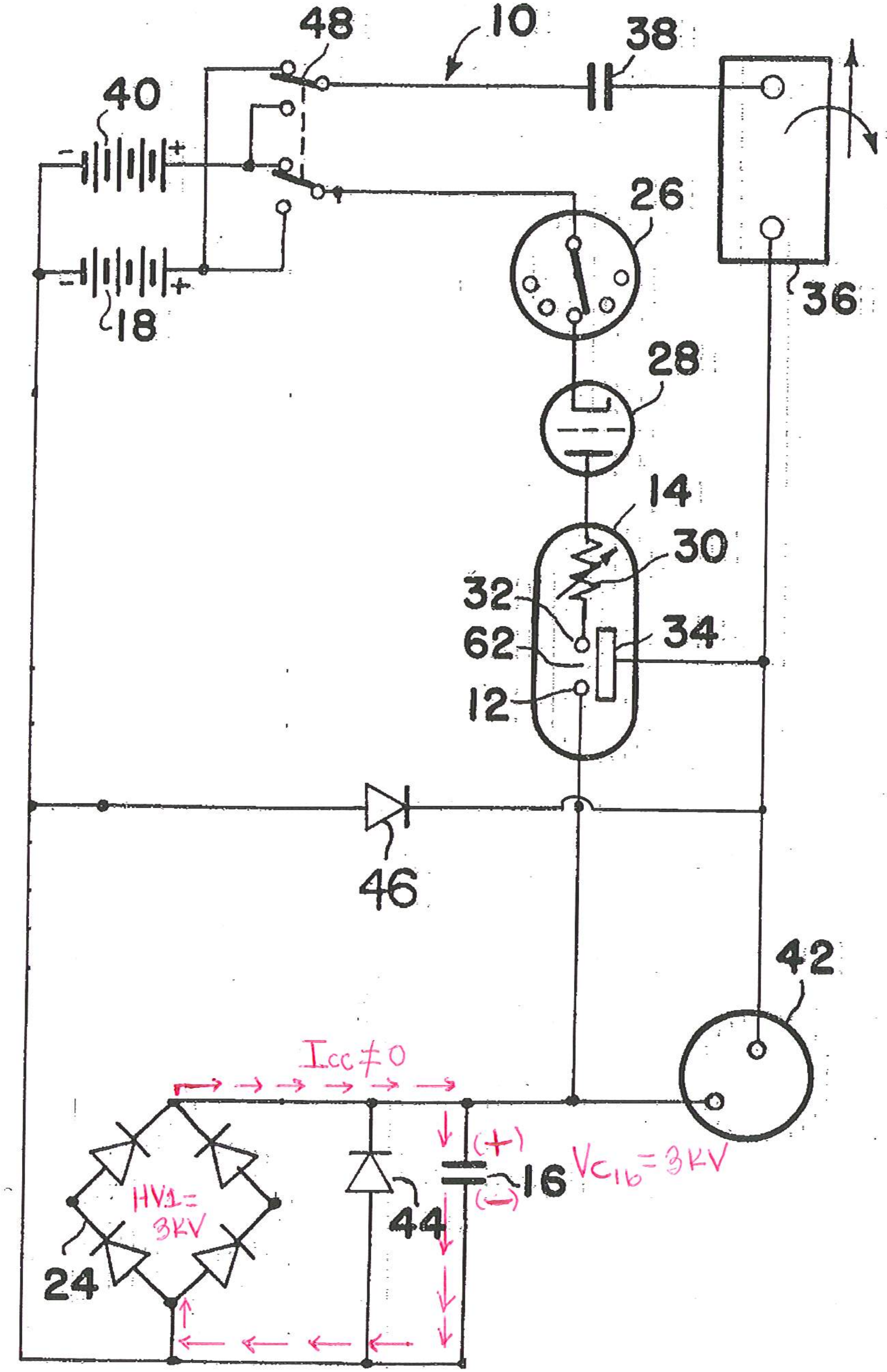

48
10
38
40
26
36
18
28
14
30
32
62
34
12
46
42
Icc ≠ 0
(+)
16
(−)
Vc16 = 3KV
HV1 =
3KV
44
24

FIG. 3a

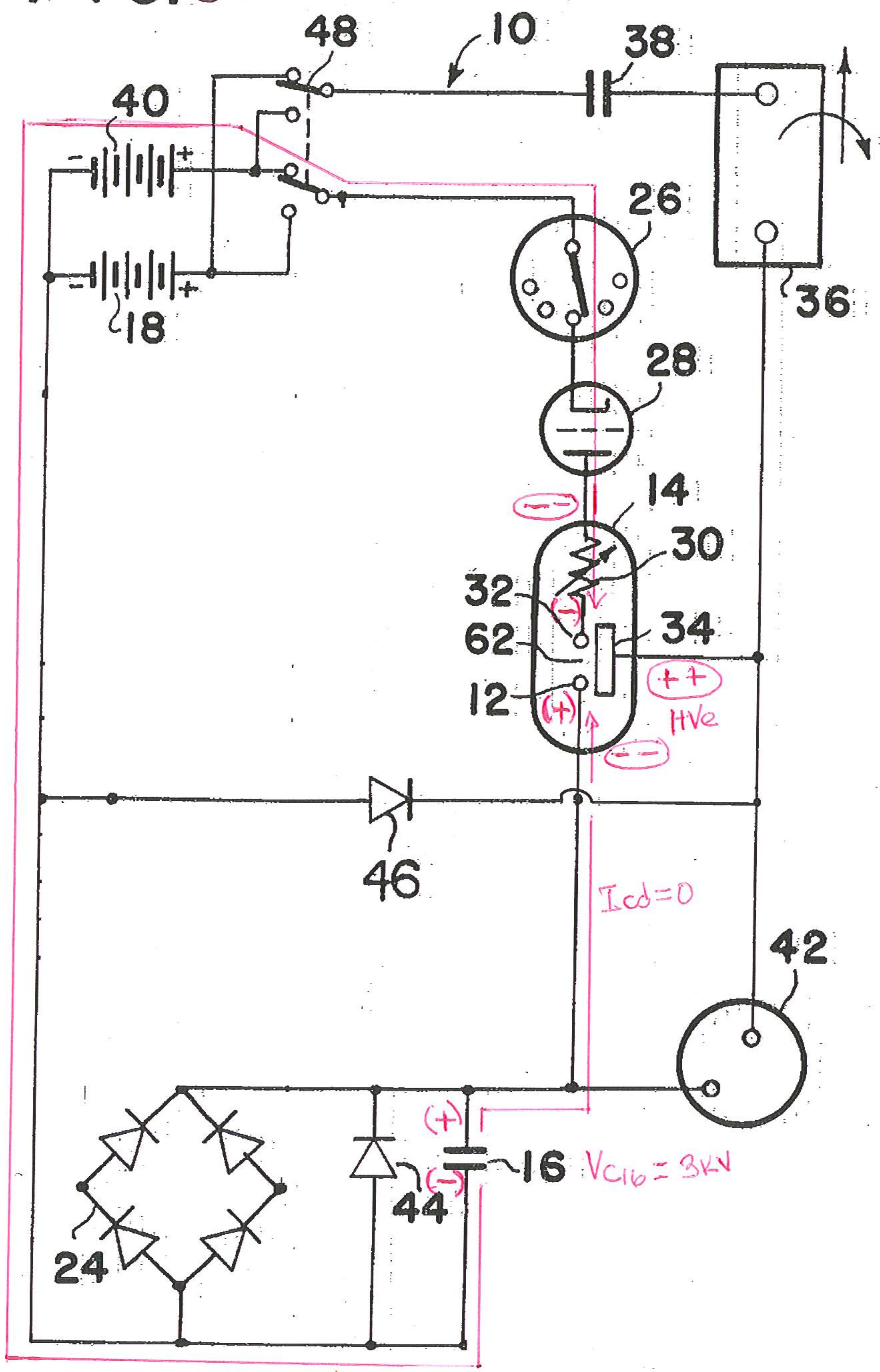
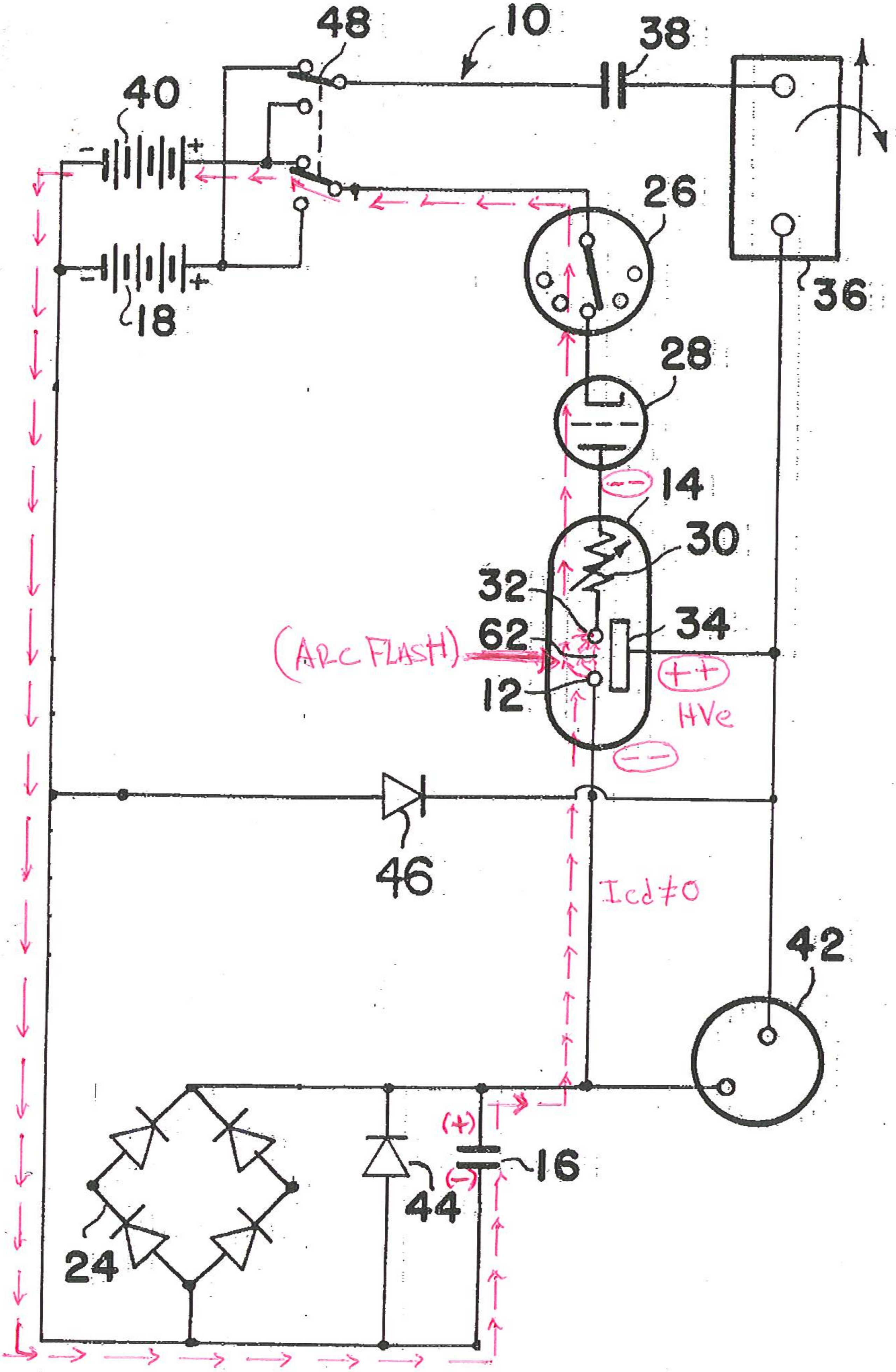

48
10
38
40
26
36
18
28
14
30
32
62
34
12
(++)
+Ve
(+)
(-)
46
Icd=0
42
16
Vc16 = 3KV
(+)
(-)
44
24

FIG. 3b



48
10
38
40
26
36
18
28
14
30
32
62
34
(ARC FLASH)
12
(++)
HVe
(--)
(--)
46
Icd≠0
42
(+)
(-)
16
44
24

FIG. 3c

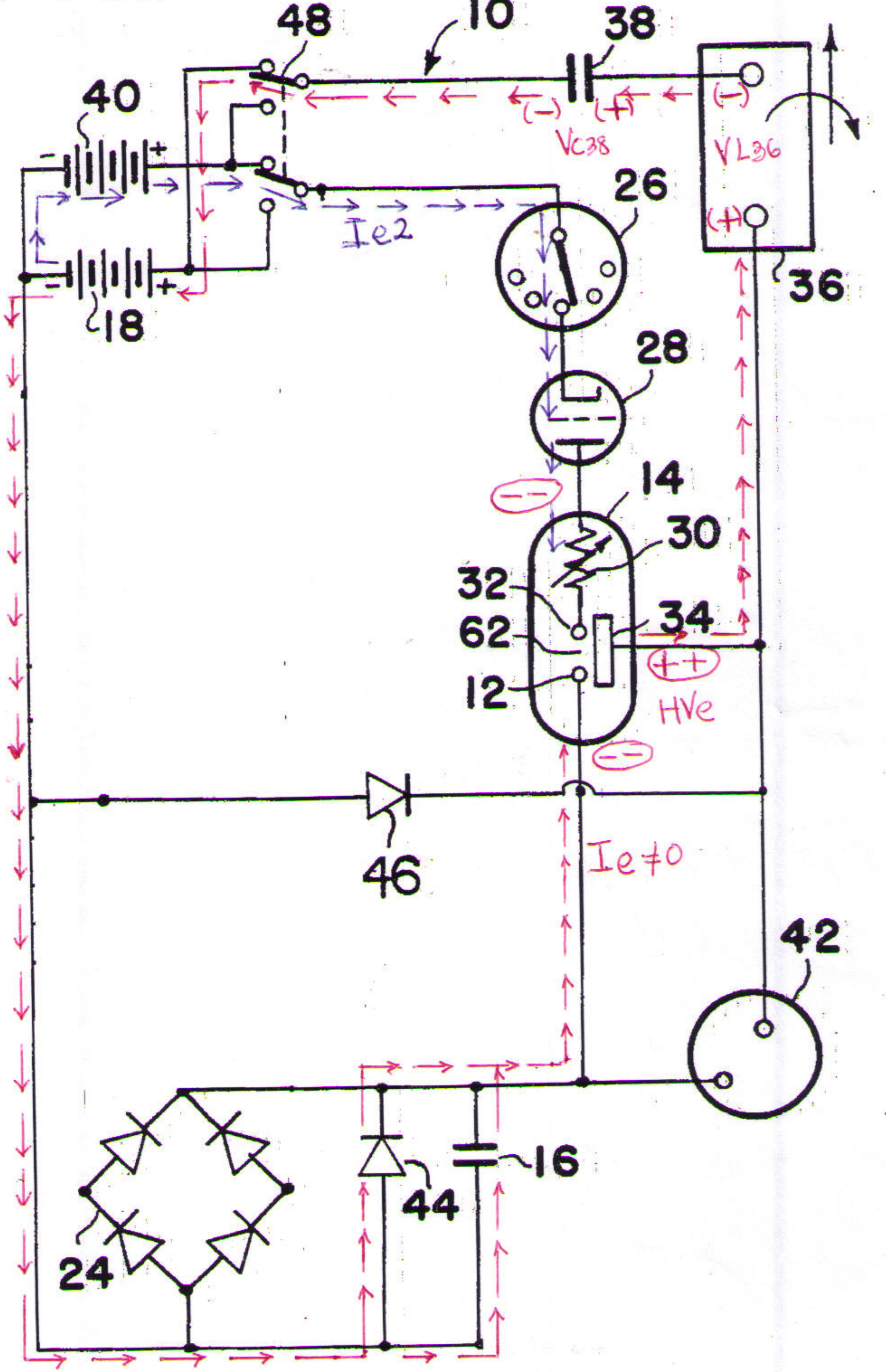

48
10
38
40
(−)
(+)
VC38
(−)
VL36
(+)
26
Ie2
36
18
28
14
30
32
62
34
12
HVe
46
Ie≠0
42
16
44
24

FIG. 4

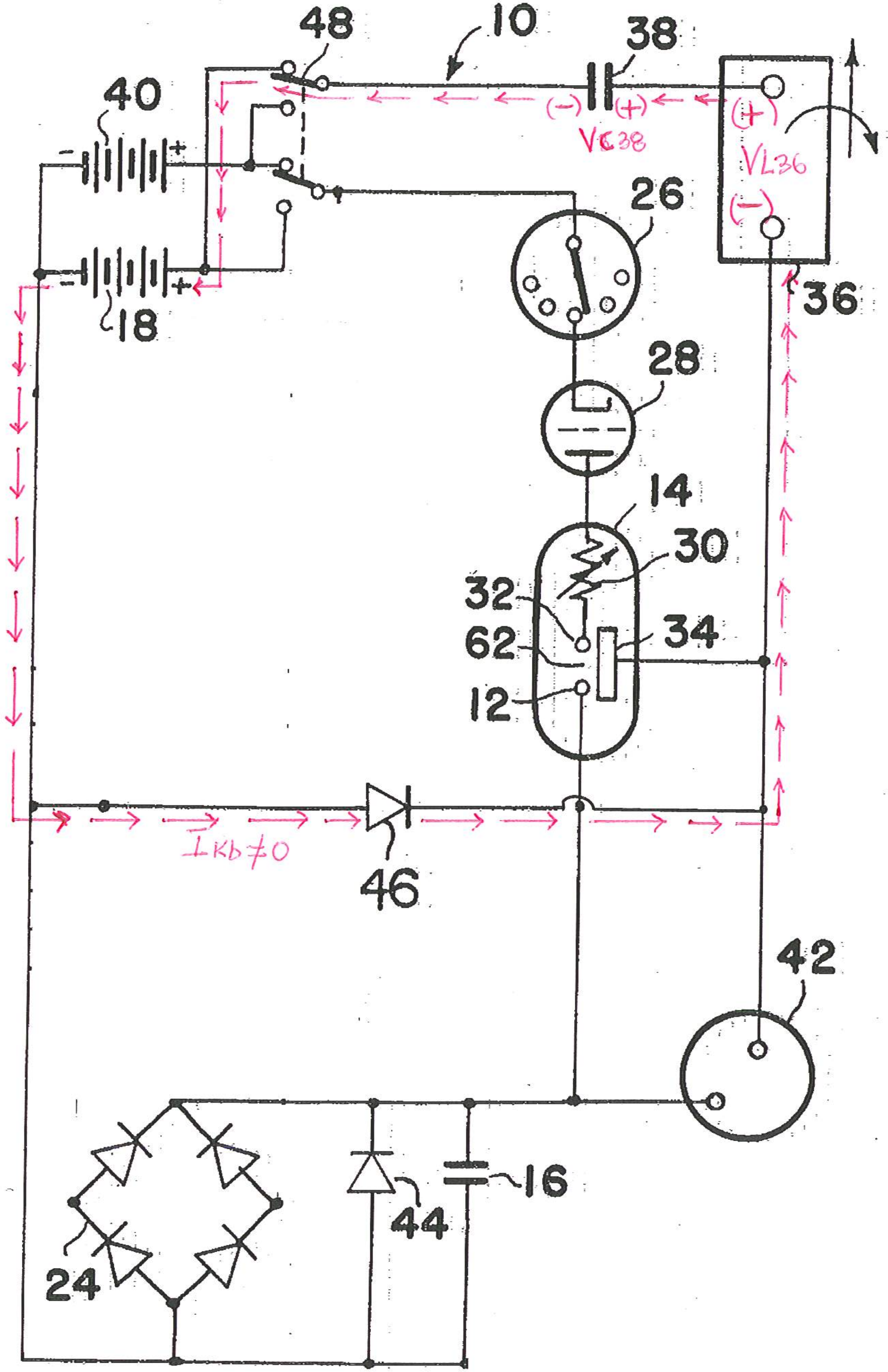
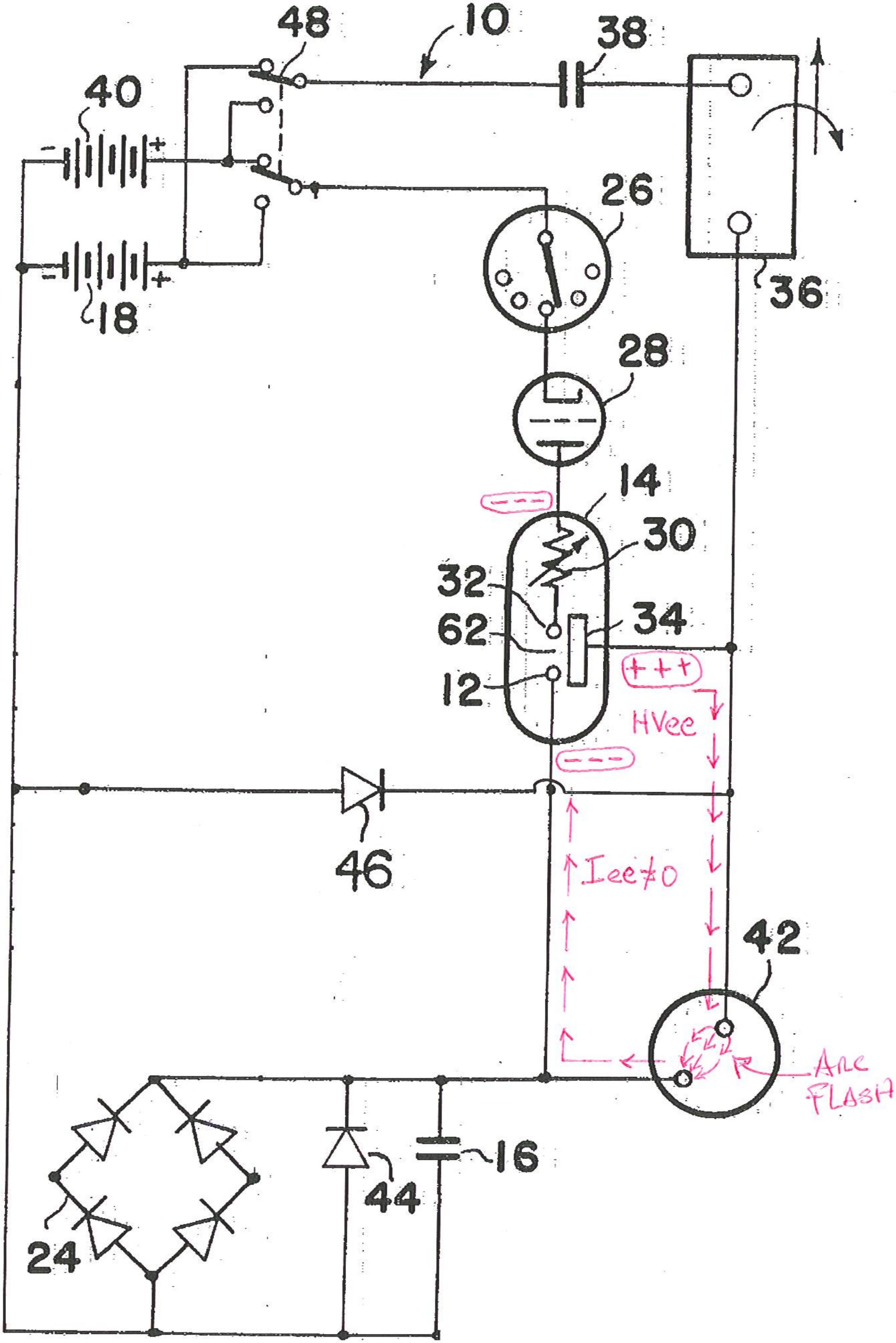


FIG. 5



48
10
38
40
26
18
36
28
14
30
32
62
34
12
+++
HVee
46
Iee≠0
42
ARC
FLASH
24
44
16

FIG. 6

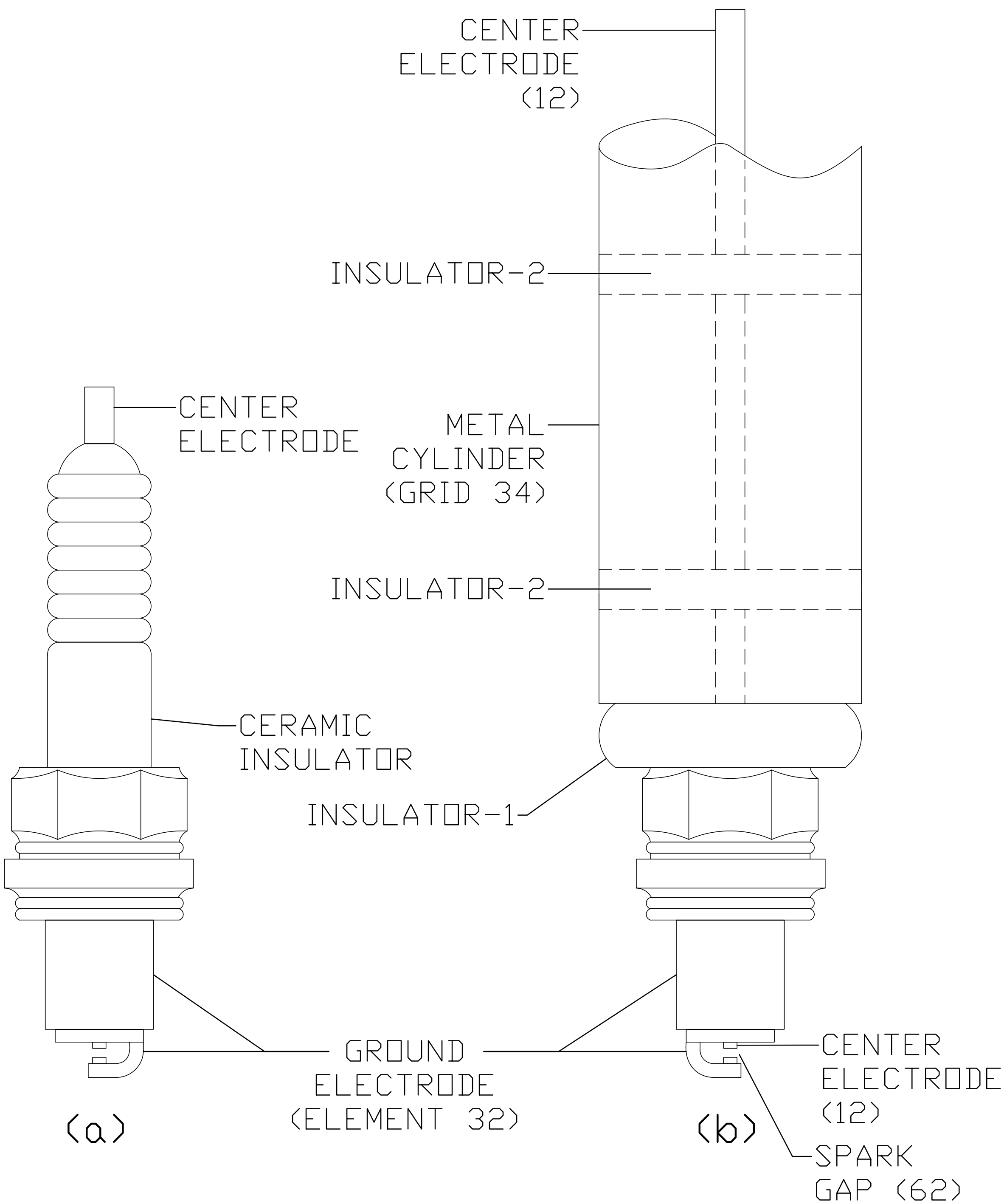

CENTER
ELECTRODE
(12)
INSULATOR-2
CENTER
ELECTRODE
METAL
CYLINDER
(GRID 34)
INSULATOR-2
CERAMIC
INSULATOR
INSULATOR-1
GROUND
ELECTRODE
(ELEMENT 32)
CENTER
ELECTRODE
(12)
(a)
(b)
SPARK
GAP (62)

FIG. 7

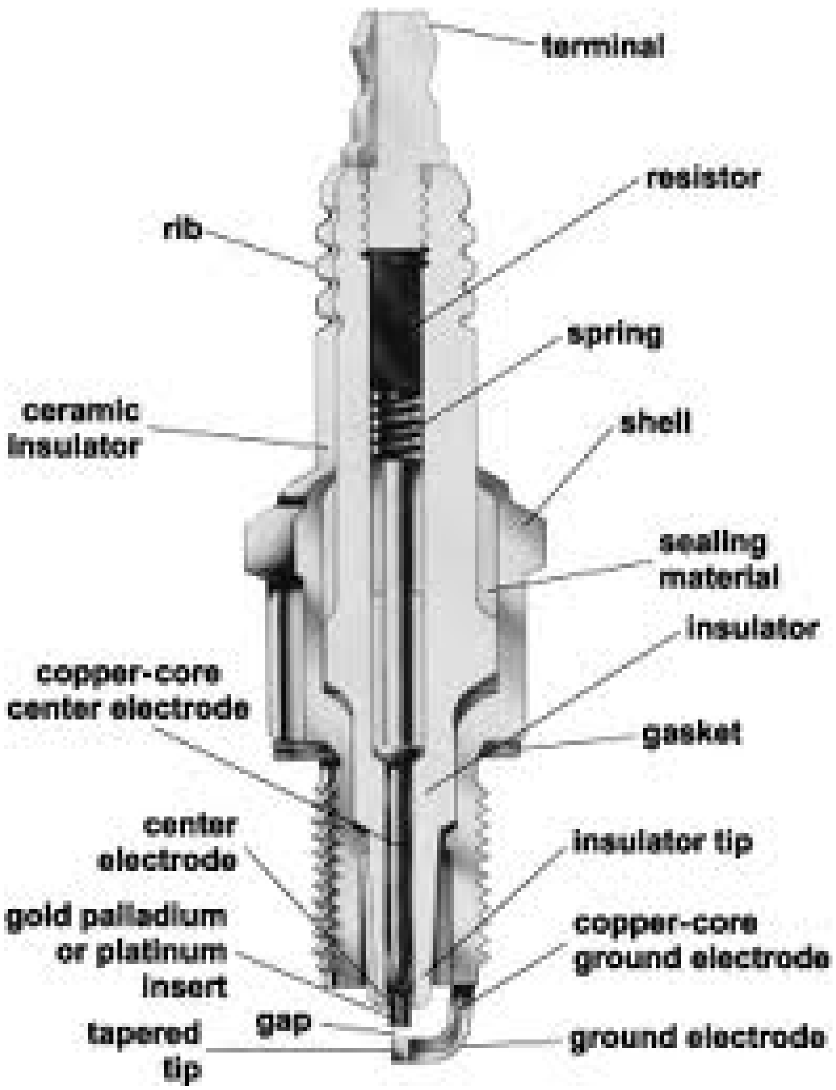

terminal
resistor
rib
spring
ceramic
insulator
shell
sealing
material
insulator
copper-core
center electrode
gasket
center
electrode
insulator tip
gold palladium
or platinum
insert
copper-core
ground electrode
gap
tapered
tip
ground electrode

FIG.8

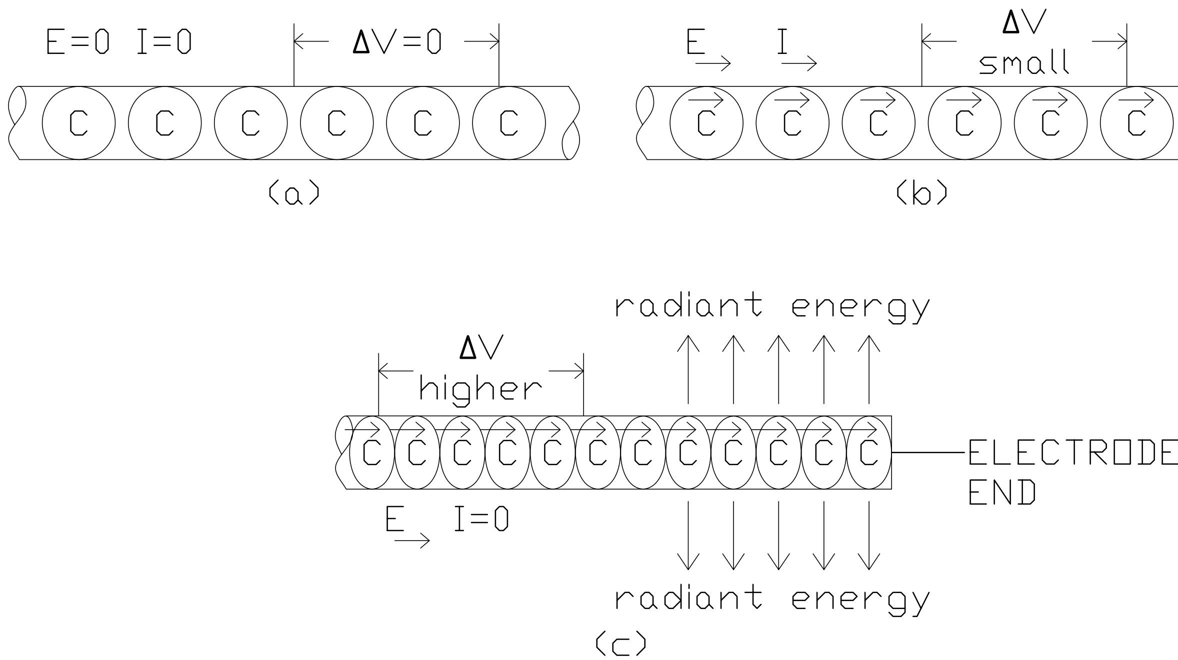


FIG.9

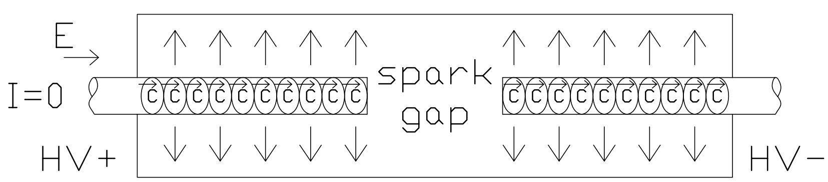


FIG.10

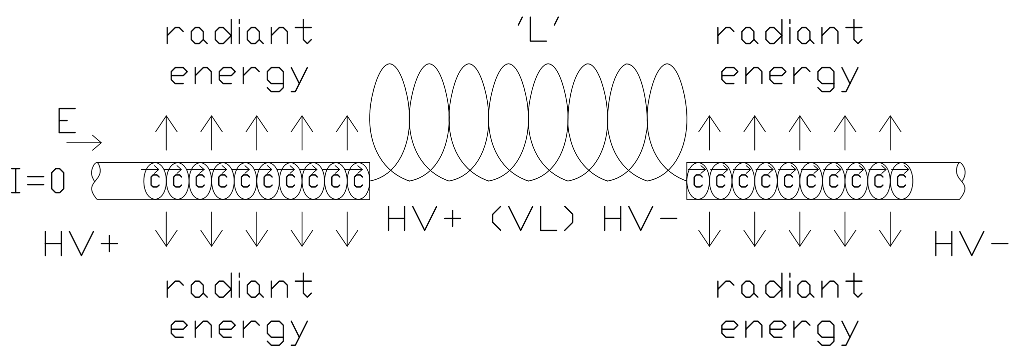


FIG.11

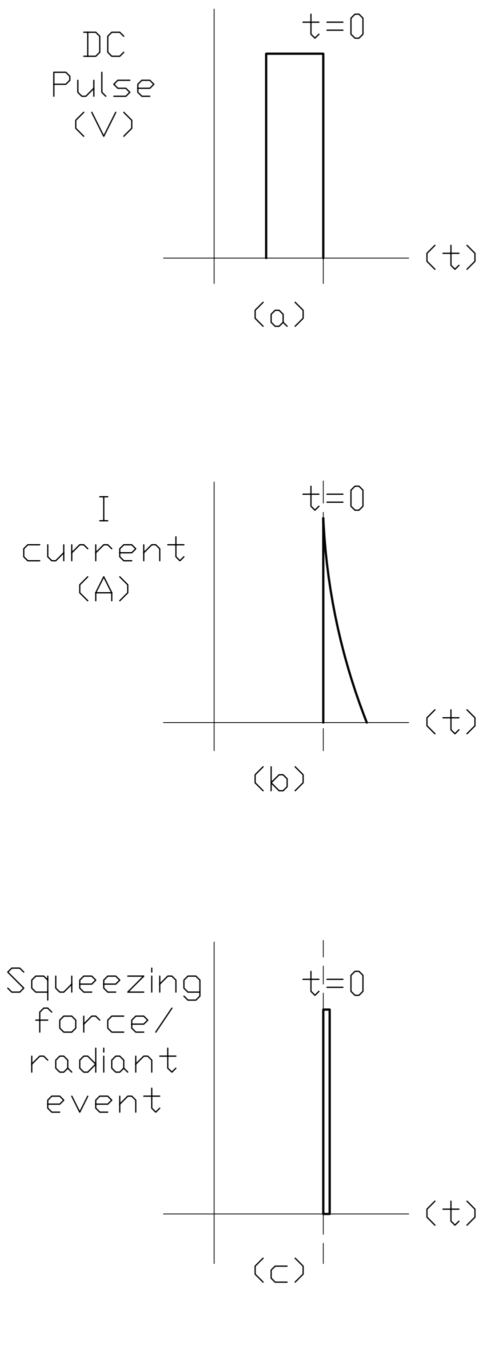
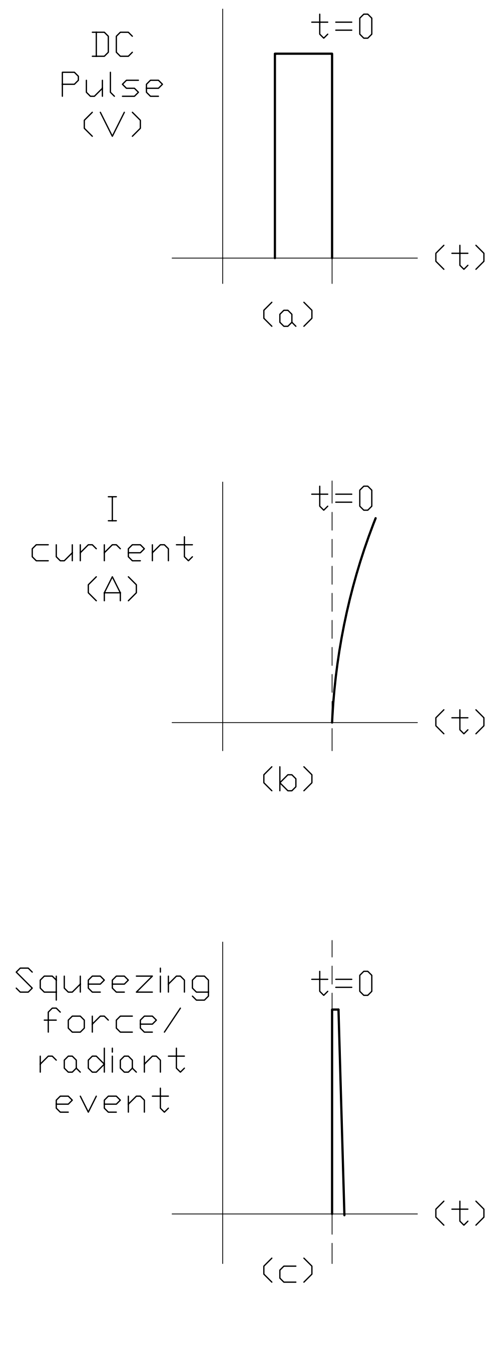

DC
Pulse
(V)
t=0
(t)
(a)
I
current
(A)
t=0
(t)
(b)
Squeezing
force/
radiant
event
t=0
(t)
(c)

FIG.12


DC
Pulse
(V)
t=0
(t)
(a)
I
current
(A)
t=0
(t)
(b)
Squeezing
force/
radiant
event
t=0
(t)
(c)

A while ago, I posted a paper describing a possible embodiment of the Toroidal Power Unit (TPU) based on the Tesla technology for radiant electricity. On this paper, I will expand on the previous concept by providing the basis for constructing radiant devices. The attached PDF document contains a description of the operation of the circuit disclosed by Edwin Gray in his patent No.4,595,975 dated June 6, 1986. Because Edwin Gray device was proven to work by witnesses and certified test reports, I concentrated on analyzing it for the purpose of isolating the radiant energy event that takes place in the energy conversion element (14). I will also conclude with a theory that the energy conversion element (14) of Edwin Gray, the Toroidal Power Unit (TPU) of Steven Mark, and the Water Fuel Condenser (WFC) of Stanley Meyer, all work on a principle pioneered by Nikolas Tesla, a principle that could be a fundamental law of nature. I will also disclose a modified spark plug that I am putting together to simulate the energy conversion element (14) of Edwin Gray. My goal is to share my latest finding with you and establish a constructed dialog that should help me out on building a better test circuit.

I have taken a second look at the radiant electrical event and have put together a sequence of diagrams explaining in a step-by-step process what I think is the basic operation of the circuit built by Edwin Gray. FIG.1 shows a circuit as disclosed by Edwin Gray in his patent. The transformer (66) and the multivibrator (20) are used to amplify the first voltage level to an intermediate or second voltage level. Then the second voltage level is amplified to 3,000 volts (third voltage level) by the turns ratio of transformer (22). The transformer (66) steps up the 120vac line voltage (AC first voltage level) based on its turns ratio, while the multivibrator (20) steps up the DC battery voltage (DC first voltage level) based on fast switching of the primary current which increases the voltage at the primary of the transformer (22) by an amount equal to L(di/dt). 'L' represents the self inductance of the transformer (22) and di/dt represents the sudden change of the primary current.

For the sake of simplicity, the voltage step-up devices are removed such as the transformers (22) and (66), and the multivibrator (20). FIG.2 is a modified version of the original circuit shown in FIG. 1 and it will be used as the basic circuit. The modified circuit in FIG.2 also shows the rectifier (46) reconfigured to have its cathode connected to the elements (34), (36), and (42). Note that the rectifiers (44) and (46) are connected in parallel in the circuit shown in FIG.1. As it will be shown later, the new current path formed with the reconfigured rectifier (46) is needed if we want to reused the energy from the collapsing magnetic field of the electromagnet (36). In addition, the protective spark gap device (42) is also revised. As shown in FIG.1, the protection device (42) is short circuiting the 3KV high voltage source composed of the transformer (22) and the bridge rectifier (24). The configuration of the rectifier (46) and the spark gap protection device (42) as shown in FIG.1 appears to be an error.

FIG.2 illustrates the path of the charging current (Icc) of the capacitor (16). Capacitor (16) is charged up to 3KV (Vc16). I do not know the minimum threshold voltage level for the radiant event to occur, but we do know that Edwin Gray used 3KV to 4KV to trigger his energy conversion element (14) successfully.

FIG.3a, FIG.3b, and FIG.3c show a sequence of events when a) the voltage (Vc16) of capacitor (16) is applied to the spark gap (62), b) when the capacitor (16) creates a discharge current (Icd) through the spark gap (62), and c) when the induced electrostatic voltage (HVe) creates a current (Ie) through the electromagnet (36).

FIG.3a shows the instant when distributor (26) switches over and close the contact that connects to the cathode of the vacuum tube (28). The closing of the contact in the distributor (26) creates a path that applies the full voltage (Vc16=3KV) of the capacitor (16) to the spark gap (62) formed between the electrodes (12) and (32).

FIG.3b illustrates the instant when the arc flash occurs through the spark gap (62) allowing the capacitor (16) to discharge. The path of the discharging current (Icd) comprises the spark gap (62), the resistor (30), the rectifier (28), the distributor (26), and the battery (40). As shown in this figure, the discharging current (Icd) also charges the battery (40) similar to a trickle charge mode. Resistor (30) protects the battery (40) by limiting the maximum current (Icd) that can flow through the battery. Because the current is not causing the radiant effect (as indicated below), the capacitance of the capacitor (16) can be small. By decreasing the discharging current the life of the spark gap (62) elements (12) and (32) is also increased.

The question that arises from comparing FIG.3a and FIG.3b is, when and how does the radiant event take place? As explained in my first post and in accordance with Garry Vassilatos (from his book "Secrets of Cold War Technology, Project HAARP and Beyond"), as soon as the electrical current appears, the radiant phenomenon stops. Therefore, the radiant event should only take place during the brief time (instantaneous) when the switch closes in the distributor (26) and just prior to the occurrence of the arc flash in the spark gap (62). This scenario is illustrated in FIG.3a. How the radiant energy is generated will depend on the initial voltage waveform reaching the spark gap (62). Each one of the electrical and electronics components forming the path shown in FIG.3a should be carefully selected and fine tuned to have a train of voltage pulses with specific duty-cycle, frequency, and waveform. For instance, it is recommended that the duration of the pulse be smaller than 0.1 µS. The wave front should change suddenly, that is, $dv/dt \approx \infty$. The latter requirement share light on the importance of the selection of the distributor (26) and the rectifier (28). I have read articles that minimize the function of the distributor (26), but if this function is eliminated, the radiant event may never take place. Without the distributor (26), the voltage at the spark gap (62) would build up in phase with the voltage at the capacitor (16) with a much lower dv/dt. The closure of the switch in the distributor (26) applies a sudden full voltage of the charged capacitor (Vc16 = 3KV) to the spark gap (62). The requirement for having a voltage pulse with high dv/dt is also the reason why Mr. Gray chose a vacuum tube (28) as a rectifier instead of a solid state semiconductor diode. It seems that Edwin Gray did not find a fast enough solid state diode for his high voltage application. The solid state diodes have an inherent delay due to the recombination of holes and electrons at the junction. FIG.3a also shows the polarity of the induced electrostatic voltage (HVe) where the grid (34) is charged positive (++) and the elements (12) and (32) are charged with a negative potential (--).

FIG.3c illustrates the path of the electrostatic current (Ie) generated by the induced electrostatic voltage (HVe). The path consists of the electromagnet (36), capacitor (38), battery (18), and rectifier (44). Because the voltage (Vc16) of capacitor (16) is reverse biasing the rectifier (44) and the bridge rectifier (24), the initial electrostatic current (Ie) may flow through the capacitor (16). Even though I have sketched the electrostatic current (Ie) flowing in FIG.3c, I suspect that this current starts circulating as soon as the electrostatic voltage (HVe) appears, that is, it may happen simultaneously with FIG.3a and FIG.3b.

As shown in FIG.3c, the electrostatic voltage (HVe) is also induced between the electrode (32) and grid (34). If the vacuum rectifier (28) is eliminated, current (Ie2) shown in blue color would also flow through the battery (18), the battery (40), the distributor (26), and the resistor (30). The function of the vacuum rectifier (28) is to prevent the flow of current through both batteries simultaneously. If the energy conversion tube (14) is used without the batteries (18) and (40), then the rectifier (28) is not needed.

FIG.4 illustrates the moment when the collapsing magnetic field of the electromagnet (36) induces a kick-back voltage (VL36) as a response to a change in the coil current (Ie). The inductance of the coil of electromagnet (36) will oppose any change of current flowing through its coil. Therefore, when current (Ie) stops, the collapsing magnetic field of the electromagnet (36) induces a voltage with opposite polarity and with magnitude so as to maintain a constant current ($Ie_{(t-)} = Ikb_{(t+)}$). The path of the current (Ikb) consists of the capacitor (38), battery (18), and rectifier (46). Now, it is clear why the configuration of rectifier (46) shown in FIG.4 is correct and the one shown in the original circuit in FIG.1 is not. Note that the battery (18) receives charge from two events, the electrostatic event of FIG.3c and the feedback event of FIG.4.

Something that puzzles me is the function of capacitor (38). At first glance, you may think that capacitor (38) and the inductance of the electromagnet (36) form a resonance circuit tuned to maximize the effect of the radiant event. But, this circuit can not oscillate because the current can only flow in one direction. It might be the case that the capacitor (38) is used to control the amount of current that can flow in the circuit. In that respect, capacitor (38) could play a role similar to the resistor (30).

FIG.5 shows the spark gap protection (42) device in action. Mr. Gray and his team could not reliably control the magnitude of the induced electrostatic voltage (HVe). Once in a while the electrostatic voltage grew dangerously high damaging some circuit components. There was a need to dump this excess energy through the spark gap (42) whenever it appears. I came to the conclusion that the problem is due to a combination of factors. For instance, the mechanical multivibrator (26) is not a reliable device. With time, the contact of this mechanical switch becomes unpredictable, distorting the waveforms of the pulses applied to the primary of the step up transformer (22). As a consequence, the voltage level (Vc16) of the capacitor (16) can be erratic. In addition, environmental conditions such as temperature, humidity, pressure, etc., can affect the performance of the arc flash in the spark gap (62).

OBSERVATIONS:
The energy level of the electric pulses is a function of the duty cycle, the frequency, and the waveform of the applied signal. The waveform should have a high dv/dt value and the turn on pulse duration should be very small. The exciting energy level of the electric pulses required to generate the radiant event should depend on the type of material used as the exciting central electrode (12). As I stated in my first post, I suspected that the radiant event might be due to a response from the molecular/atomic structure of the central electrode (12) when subjected to high-frequency, high-voltage electric pulses. This concept is based on the theory of quantum mechanics related to the emission and absorption of

photons when the electrons move between different orbits and quantum states. When electron moves to a lower orbit, a photon of light is emitted. On the contrary, when the electron moves to a higher orbit, a photon of light is absorbed. Here there is a pattern between the movement of electrons and the radiant energy emission/absorption. A similar pattern of energy and movement of electrons is found in x-ray events. X-rays are generated when electrons travelling at high speed are brought to a sudden stop. For instance, all cathode ray tubes (CTR) used in old TV sets had labels warning about x-ray radiations. The image created on these tubes is generated by an electronic emission striking an anode coated with a phosphorous material. The acceleration of the electrons hitting the anode is a function of the electric field generated by the high voltage applied between the cathode and the anode. TV technicians were advised not to increase the flyback voltage above certain level because of possible generation of dangerous x-ray radiations.

Again, the x-ray event shows a pattern between the movement of electrons and radiant energy. I was not able to find further information to support my theory until I came across with the experiment performed by Rudolph L. Mossbauer, a graduate student at Caltec, as described by Vassilatos on page 185. Rudolph observed a phenomenon where (quote) "Gamma ray emitted from specific elements occurs with emissions of phonons, acoustic waves of atomic wavelength. Each Gamma ray emitted from the crystalline lattice of one of these elements is accompanied by a constant production of super high frequency sound. The phenomenon was considered to be an amazing natural behavior, the consequence of recoil in a crystalline structure. Each Gamma ray emitted, results in an equal and opposite phonon emission in the lattice. Here for the first time, scientists were observing the details of radioactive decay, noting that photons, an energy phenomenon, were always accompanied by phonons, a material phenomenon."

Furthermore, (quote) "it was found that additions of sound energy to small wires samples of these elements, later known as MOSSBAUER ISOTOPES, produced very sharp Gamma ray emissions." It was concluded that the exciting energy level was reached (quote) "when sharp shockwave applications effectively coupled with crystalline lattice structures in a real mass-related resonance..." In other words, Rudolph's experiment demonstrated a relationship between radiant energy and mechanical energy corresponding to the oscillations of the lattices causing an acoustic sound wave.

It is my belief that this resonance effect is part of a more fundamental concept in which any material (metal in this case) can be place in an atomic/molecular resonance state that generates weird sorts of energies such as the radiant electric energy pioneered by Nikolas Tesla. And, this same resonance technique can be used to break the bonding forces among the atoms within a molecule. For instance, Staley Meyer used this resonance technique to split the water molecules into hydrogen and oxygen.

Based on the above, I recommend testing with metals other than copper as the exciting element. I would say, it should be easier to excite heavier metals because of the much-crowded conditions of its atomic orbits. Good candidates are lead and tin.

On the other hand, it is interesting to think of the TPU as an energy conversion element (14). The embodiment of the TPU could be similar to the energy conversion element (14) when the electrostatic grid (34) is replaced with a copper coil. The electrostatic output voltage (HVe) should be taken not between the coil terminals but between the coil (34) and the exciting electrode (12) as shown in FIG.3c.

Finally, I am in the process of constructing a low cost version of the energy conversion element (14) based on an automobile spark plug. The conversion from a two-terminal spark plug into a three-terminal energy conversion device (14) is shown in FIG.6. For the conversion, remove the ceramic insulator. Once the ceramic insulator is removed, then, replace the center electrode with a metal wire. The metal cylinder acting as the electrostatic grid (34) is attached with electric insulators 1 and 2 as shown in FIG.6. Please, note that some spark plugs have others components along the center electrode that also require removal such as resistors, spring mechanisms, etc. Refer to FIG.7.

Still, there is the question of, why does the radiant energy event manifest itself in circuits with spark gaps such as the one described in this paper and circuits with induction coils only? The answer to this question may be found if we assume that the radiant energy event is due to the "SQUEEZING CONDITION" of the molecules/atoms in the material of the exciting electrode. The spark gap devices and induction coils can create the squeezing effect required to generate radiant energy.

First of all, let us define the "SQUEEZING CONDITION" as the condition that exists when a high DC voltage pulse (high dv/dt) is applied to electric charges while the current is still zero (I = 0). That is, the squeezing Condition refers to Δv/Δt is high and I = 0. Please, note that the squeezing condition can also exist for I ≠ 0, but for the sake of simplicity I am only considering the case I = 0.

FIG.8a is an illustration of the charges in a natural state in a piece of conductor. No DC voltage is applied and the electric field 'E' and the current 'I' are zero.

FIG.8b shows the movement of the charges (current I ≠ 0) in steady state when an electric field 'E' is applied. Under this condition the electric field 'E' is very small within two points along the conductor. In other words, a small voltage applied to a wire can produce high current circulation due to its low resistance. As shown in FIG.8b, the charges moves in orderly fashion and the squeezing effect is negligible.

FIG.9 illustrates the condition in a discontinuous electrode when a high intensity electric field 'E' is applied. The discontinuity creates a jamming condition at the end of the electrode. The charges are squeezed against each other until a breaking point is reached and the charges jump off the end of the electrode into the spark gap. Keep in mind that this process happens at very high speed. In the instant of the occurrence of the squeezing condition, the electric field 'E' along the electrode has a gradient profile and it is considered to have a much greater value between two points along the electrode. If the voltage gradient is high enough, the squeezing condition can reach a critical point where the radiant energy can manifest. As soon as the charges start moving through the gap due to the arc flash occurrence, the squeezing condition decreases and the radiant event stop.

FIG.10 illustrates the case of radiant energy generation with an induction coil. The wire connected to the coil terminals have been enlarged for the purpose of clarity. When the DC voltage pulse is applied to an inductor 'L' at t=0, then $I(0^-) = I(0^+) = 0$. The way the inductor forces the initial current to zero is by inducing a voltage with an opposite polarity and equal magnitude to the applied DC voltage pulse ($VL = L*di/dt$). Recall that even though $I = 0$, its derivative is very high at $t = 0$. As shown in FIG.10, the charges along the conductor between the DC pulse source and the induction coil 'L' are squeezed by two opposite voltages. If the squeezing condition reaches a critical point, the radiant event can occur. As noted, the resulting squeezing condition in the conductor is similar to the case with the electrode of the spark gap as explained above.

FIG.11 and FIG.12 illustrate a possible graphic scenario of what is going on in the spark gap device and the induction coil. In both cases the currents are zero previous to the application of the DC pulse at $t = 0$. When the arc flash occurs in the spark gap device, the capacitor discharges having a maximum current value at $t = 0$ and then decays rapidly. On the other hand, when the DC pulse is applied to the coil at $t = 0$, the current starts rising rapidly from zero up to a maximum current value as time passes. Refer to FIG.11b and FIG.12b.

FIG.11c and FIG.12c illustrate a possible profile of the squeezing forces and radiant energy events for the spark gap circuit and the induction coil, respectively. Because the current in the spark gap starts from a maximum value, the radiant event should die faster than the case for the coils.

Thank you for your time, and keep up the good work!

WONJU.