

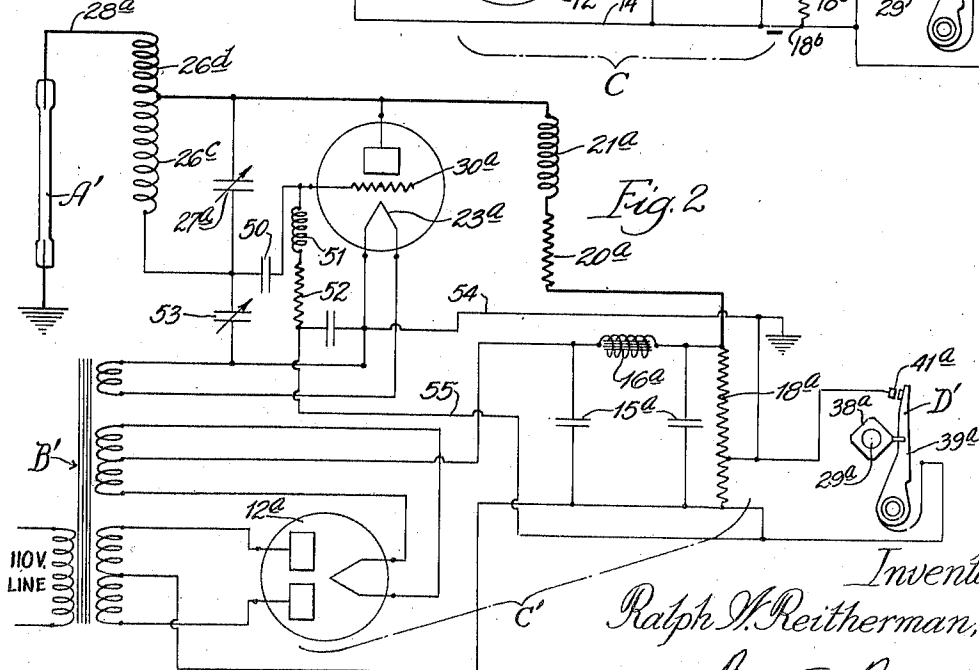
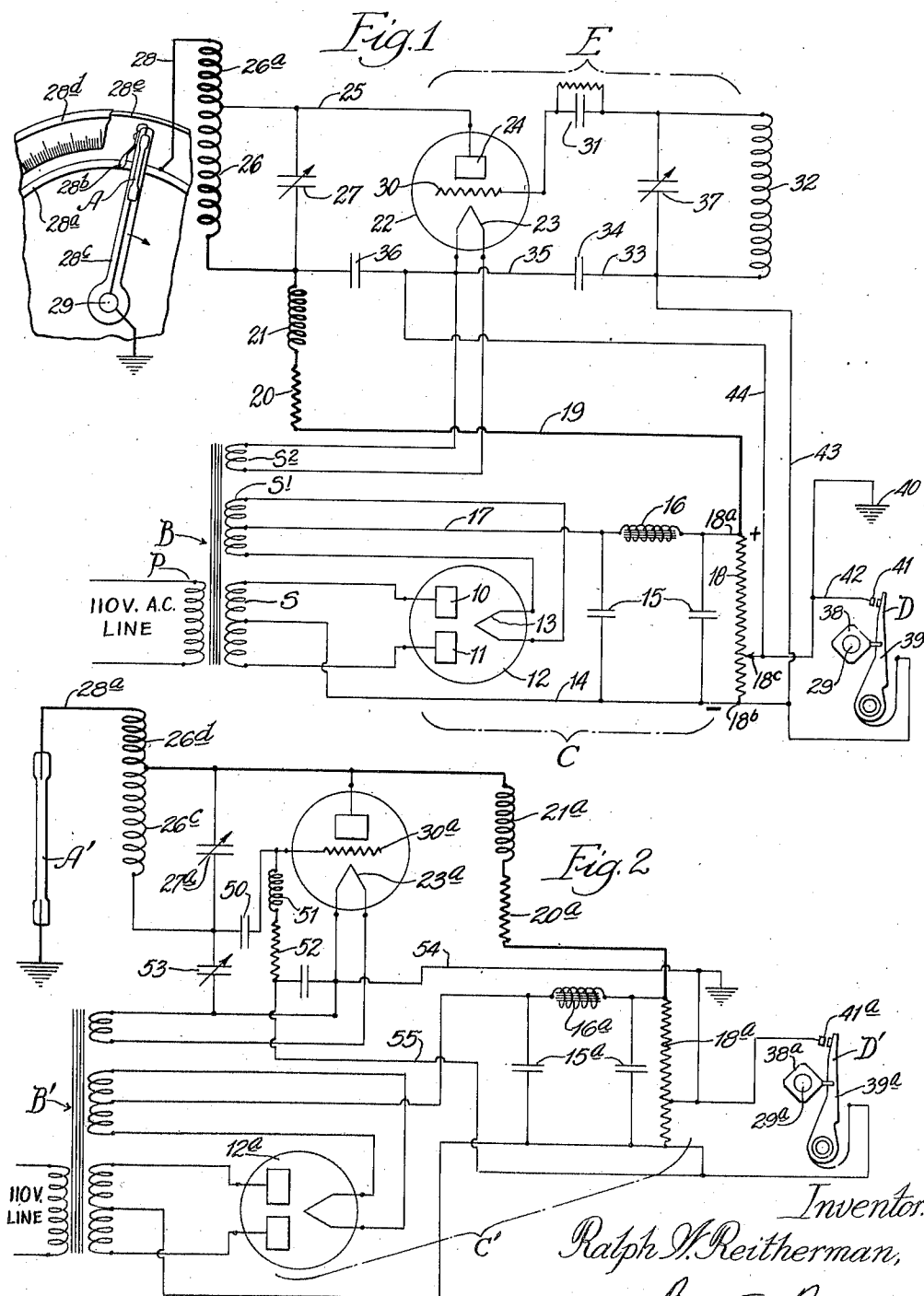
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LIGHTING NEON TUBES

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LIGHTING NEON TUBES

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1 Claim. (Cl. 177—311)

An object of this invention is to provide an improved means for lighting a neon tube, and more particularly in an assembly such as that fully shown and described in the patent to Haskins No. 1,966,066 for Distributor tester.

Another object of this invention is to provide a means for lighting neon tubes wherein the initial current which controls the lighting of the tube is of the order of a milliampere, or less, this current controlling a greater current which is of sufficient strength to effect the lighting.

Still another object of this invention is to provide a constantly applied direct current voltage for lighting the tube which of itself is insufficient either to light the tube or to maintain it lighted, and superimposing on that current a high frequency alternating current whose voltage combined with that of the direct current is sufficient to light the tube and to maintain it lighted while the alternating current voltage is applied.

These and other objects, as will hereinafter appear, are accomplished by this invention which is fully described in the following specification and shown in the accompanying drawing, in which—

Figure 1 is a diagram of connections of apparatus for lighting a neon tube; and

Fig. 2 is a diagram of a modified form of the apparatus.

The embodiment illustrated in Fig. 1 comprises essentially a neon tube A, a transformer B, the primary of which receives current from an alternating current power supply line, rectifying and filtering apparatus C adapted to supply a substantially constant direct current to the neon tube A of a voltage, however, insufficient to maintain the tube lighted, a breaker D, and a radio frequency oscillator circuit E which is controlled by the breaker D. Closing the breaker D takes the negative grid bias off the oscillator tube, thereby causing it to oscillate at radio frequency which when added to the direct current voltage which is constantly applied is sufficient to light the tube.

The transformer B consists of a primary P, a center tapped secondary S, the ends of which connect with plates 10, 11 of the double wave rectifier tube 12, which has a filament 13 lighted by means of a secondary S' of the transformer. A lead 14 taps the center of the secondary S and passes to the condensers 15 of the filter circuit, these condensers lying one on each side of a filter choke coil 16, this coil connecting

through a lead 17 with the center of the secondary coil S', all this being well known in this art.

A high resistance voltage divider 18 connects to the ends of the leads 14 and 17, the upper end 18^a of this resistance connecting through a lead 19, a limiting resistor 20, and a radio frequency choke coil 21 with the tuned frequency plate circuit of an audion oscillator tube 22. This audion tube has a filament 23 supplied with current from any suitable source, such as the secondary coil S² of the transformer B. This tube has a plate 24 which connects through a lead 25 with a radio frequency coil 26, the opposite end of which connects with the radio frequency choke 21. A variable condenser 27 is placed across the terminals of the coil 26, an extension 26^a of the coil 26 being connected through a lead 28 with one end of the neon tube through a collector ring 28^a, and a brush 28^b, the tube and brush being mounted on an arm 28^c which is rotatable on a shaft 29 which is driven directly or indirectly from the distributor shaft, while the opposite end of the neon tube is suitably grounded on the shaft 29. The neon tube is enclosed except for a narrow radial slit as illustrated in Haskins Patent No. 1,966,066 and has a graduated scale 28^d mounted on an insulating housing 28^e.

The audion oscillator tube 22 has a grid 30 which connects through a grid leak condenser 31 with one end of a radio frequency coil 32, the opposite end being connected through a lead 33 with a radio frequency by-pass condenser 34, the opposite end of this condenser being connected through a lead 35 with one of the filaments 23 and with a second radio frequency by-pass condenser 36, the opposite side of this condenser being connected to the lower end of the coil 26. A second variable condenser 37 is placed across the terminals of the coil 32. This provides an oscillator of a well known type having both a tuned plate circuit and a tuned grid circuit. The means for controlling the oscillation of the circuit E will now be described.

A distributor breaker or the like D has a cam 38 mounted on a shaft 29 which preferably is the same shaft as that on which the arm 28^c is mounted which carries the rotating neon tube A. The cam 38 operates a breaker 39 which as it oscillates under the action of the cam is adapted to alternately make and break connections with the stationary breaker point 41 which connects through a lead 42 with a ground 40. The breaker connects through a lead 43 with the

lead 33, and also with the lower end 18^b of the voltage divider 18. The breaker point 41 also connects through the lead 42 with an intermediate tap 18^c of the voltage divider, and through a lead 44 with the lead 35 which connects with the filament 23. The lower end of the voltage divider is negative and the upper end is positive. Thus the negative bias applied to the grid of the oscillator tube is sufficient to block that tube and prevent it from oscillating. The instant the breaker points 39, 41 are closed the grid of the oscillator tube is grounded, thereby removing the biasing voltage and causing the tube to oscillate.

The potential applied to the neon tube from the voltage divider is not sufficient to ionize the tube, nor is this potential sufficient to maintain ionization by itself, but this voltage plus the high frequency generated by the oscillator is sufficient to cause this tube to be brilliantly lighted and to remain lighted so long as the breaker point 39, 41 are closed.

As the cam 38 is rotated the breaker arm 39 will alternately rise and fall thereby opening and closing the circuit through the breaker point 41 so as to alternately block the oscillator tube against oscillation and unblock the same. Since the neon tube A is rotating in synchronism with the distributor cam 38, the result is that a series of continuous bright flashes occur which very definitely mark the movement of the arm 26^c during which the breaker points are closed. The neon tube operates under a graduated scale 28^d. Consequently, the operator is able to read on this scale with great accuracy the points of opening and closing the breaker points and to tell whether there is any tendency of the breaker arm to bounce when the cam is rotating at high speed.

In Fig. 2 the rotary arm of Fig. 1 has been omitted and the neon tube A' is shown connected to the lead 28^a on one side and the ground on the other. The wiring diagram of this figure is substantially the same as that of Fig. 1, except for certain changes in the radio frequency amplifying circuit. The coil 32 and tuning condenser 37 are omitted, the grid 30^a being connected through a by-pass condenser 50 with one side of the coil 26^c and its tuning condenser 27^a. The grid also connects to ground through

a radio frequency choke coil 51 and a grid leak 52. The tuning coil 26^c is connected to ground through a variable condenser 53, so that the ground can also be tuned into resonance with the plate circuit.

Although not shown, the neon tube A is mounted on a rotating arm, as in Fig. 1, and is preferably rotatable on the distributor shaft 29^a, or, if desired, it can be driven at a speed which is a multiple of the speed of the distributor shaft. The cam 38^a is operable as before to move the breaker arm 39^a to make and break contact with the fixed contact 41^a. As contact is made the grid of the oscillator tube is unblocked and the circuit oscillates as before, with the result that a greatly increased voltage is generated in the lead 28^a at the terminal of the neon tube which operates in the same manner as before.

It will be understood that the term "neon tube" used in the specification and claims is intended to include all gaseous discharge tubes, and the like. Also, the oscillator circuits shown are illustrative only.

The direct current supply to the neon tubes is shown in heavy lines in both figures.

I claim:

In combination, a neon tube, a voltage divider, a distributor breaker, means for applying to the ends of the voltage divider a direct current potential below the ionization potential of the neon tube, an oscillator circuit including an audion tube, the positive end of the voltage divider being connected to one end of the neon tube, the opposite end of the neon tube being grounded, an intermediate point of the voltage divider being connected to the filament of the audion tube, to ground and to the stationary contact of the distributor breaker, and the opposite end of the voltage divider having a negative potential and connected to the grid of the audion tube, and to the movable arm of the breaker whereby closing the breaker points cancels the negative bias of the grid and permits the circuit to oscillate so that the radio frequency voltage thus generated, added to the direct current voltage applied to the tube will light the same and maintain it lighted so long as the breaker points are closed.

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