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S. CUKER
COUPLING AND TUNING CIRCUIT FOR HIGH
FREQUENCY LUMINESCENT SIGN

2,913,631

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2 Sheets-Sheet 2

FIG. 3

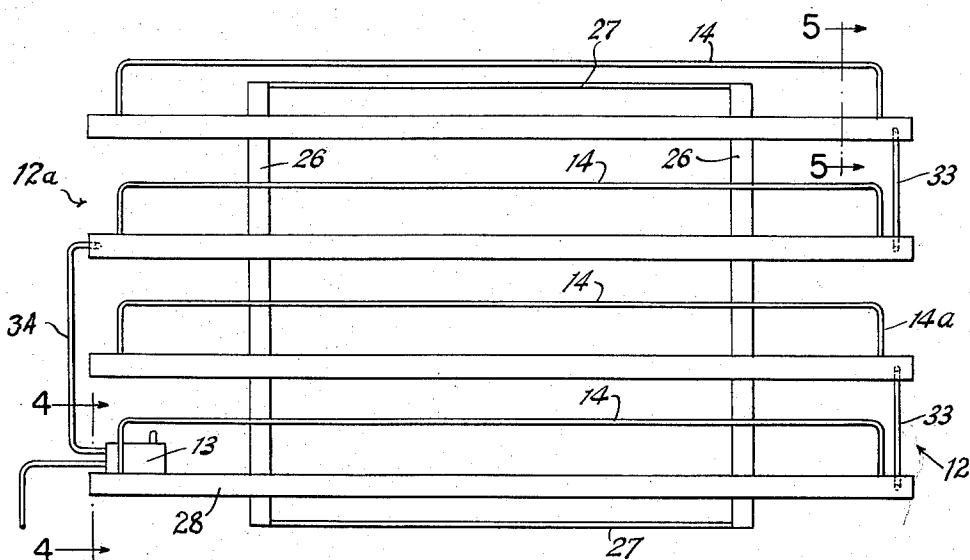
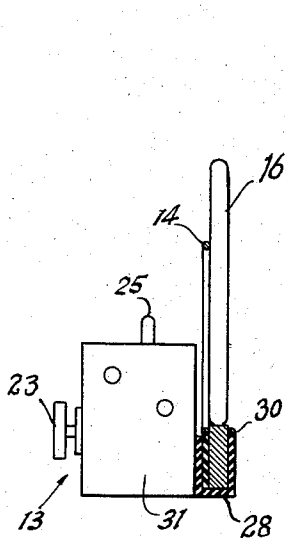


FIG. 4

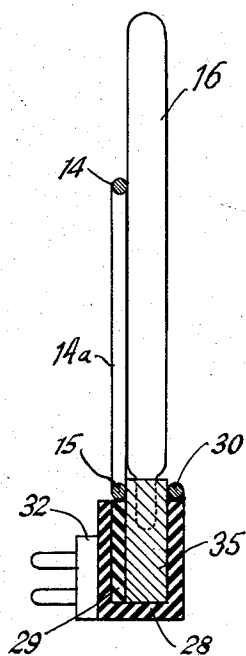


FIG. 5

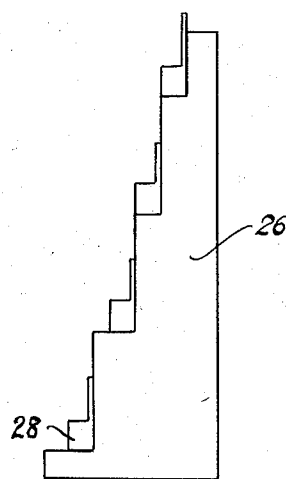


FIG. 6

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COUPLING AND TUNING CIRCUIT FOR HIGH FREQUENCY LUMINESCENT SIGN

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Application March 15, 1956, Serial No. 571,663

10 Claims. (Cl. 315-248)

This invention relates to a combination coupling and tuning circuit for use with high frequency luminescent signs having individual, movable characters in the form of electrical discharge tubes containing ionizable gases.

In known luminescent signs utilizing a high frequency current generator to excite the discharge tubes, the generator is usually directly attached to the sign or is located in close proximity to the sign, in order to insure optimum transmission of the high frequency current to the sign. Such an arrangement has a number of obvious disadvantages and in many cases it would be highly desirable if the generator could be located at some distance from the sign.

Accordingly, an object of this invention is to provide for use with a high frequency sign and generator, a coupling circuit which allows an extended transmission line to interconnect the generator and sign, yet maintaining efficient operation of the sign.

Another object of this invention is to provide a coupling circuit for use with a transmission line between a high frequency generator and a luminescent sign of the character described, which matches the input and output ends of said line in terms of impedance values at said points, and further, provides optimum Q values at said points, together with proper operating voltages at the sign end of said line.

A further object of this invention is to provide a coupling and tuning circuit for use with a transmission line between a high frequency generator and a plurality of luminescent signs, the circuit being adjustable to secure optimum operation for any given number of signs in actual use.

Still another object of this invention is to provide a circuit of the character described, for use with a transmission line between a high frequency generator and one or more luminescent signs, the circuit being adjustable to secure optimum luminescence for varying loads as determined by the total number of discharge tubes associated with each sign.

Yet another object of this invention is to provide a single sign assembly having attached thereto a combination coupling and tuning circuit of the character described, said sign assembly being adapted to be coupled with one or more additional sign assemblies.

Yet a further object of this invention is to provide a circuit of the character described, for use with a high frequency luminescent sign and including a pilot device for visibly indicating the luminescent condition of the discharge tubes on the sign.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

In the drawing,

Fig. 1 is a circuit diagram of a coupling and tuning circuit embodying the invention;

Fig. 2 is a diagrammatic showing of said circuit in association with a plurality of signs;

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Fig. 3 is an elevational view of one arrangement of a plurality of signs;

Fig. 4 is a sectional view taken on the line 4-4 of Fig. 3;

Fig. 5 is a sectional view taken on the line 5-5 of Fig. 3;

Fig. 6 is an end view of the sign assembly shown in Fig. 3.

Referring in detail to the drawing, and particularly to Fig. 1, 10 designates a high frequency current generator, which is connected by a transmission cable 11 to a high frequency luminescent sign generally indicated at 12, by way of a combination coupling and tuning circuit embodying the invention and generally indicated at 13.

The generator 10 comprises the usual combination of components, not shown, such as oscillator tube, transformer, resistances, capacitors and the like, designed to supply to cable 11 a current of a given frequency, preferably a frequency prescribed by the Federal Communications Commission for the purpose indicated, such frequency conveniently being 13.560 megacycles.

The cable 11 may be of the coaxial, shielded type well known in the art, and preferably may be of the type designated as military type RG 59/U. However, other suitable double conductor lines may be used.

The sign 12 embodies at least two parallel electrodes 14, suitably mounted on a dielectric support, in a manner known in the art and adapted to have associated therewith the usual individual characters or letters formed of glass tubing and filled with ionizable gases, as indicated generally at 16. Such characters are movable and may be arranged as desired, in proximity to electrodes 14, 15 for excitation and luminescence by the high frequency currents supplied to said electrodes. Preferably, the sign 12 may include a third electrode as hereinafter described, such arrangement of electrodes being the subject of copending application Ser. No. 564,459, filed February 9, 1956, now Patent No. 2,901,674.

The combination coupling and tuning circuit 13 comprises an inductance 15, a multiple contact switch 18 for selectively connecting capacitors 19, 20, 21, 22 of different values, to one side of said inductance, and a variable air-gap type condenser 23 connected to the other side of said inductance. A winding 24 in coupled relation to inductance 17 is connected to a pilot light 25. Such circuit is interposed between the cable 11 and electrodes 14, 15, the capacitors being in shunt relation to said electrodes while the inductance 17 is in series with electrode 14.

For use with an indicated output frequency of 13.560 megacycles, the inductance 17 may have a value of 1.2 microhenries; the condensers 19, 20, 21, 22 and 23 may have capacitances respectively of 470 mmf.; 560 mmf.; 330 mmf.; 150 mmf.; and 140 mmf.

As shown in Fig. 2, the coupling circuit 13 may interconnect more than one sign assembly, as 12, 12a, to the generator 10. It has been found, that for optimum operation any one sign assembly should have a maximum electrode length of approximately 6 feet. As indicated in Fig. 2, the sign assemblies 12, 12a may be made up of two units each in coupled relation, such units being conveniently about 3 feet long.

With the coupling circuit embodying the invention, the length of the transmission cable 11 may be extended to as much as about 50 feet, although for most purposes, a maximum length of 12 feet has been found to be adequate. Despite such extended separation of the generator 10 from the electrodes of the sign assemblies 12, 12a, optimum operating voltages are attained at all points in the electrodes 14, 15 of said sign assemblies.

As shown in Fig. 3, the sign assemblies 12, 12a may be arranged in tiers on suitable bracket members 26 in upstanding relation and interconnected as at 27; the members 26 being cut out to receive the assemblies 12, 12a in stepped relation.

The individual sign units may comprise an elongated channel shaped dielectric member 28, with an electrode mounting strip 29 secured therein. Said strip carries electrode 14 spaced therefrom by bent portions 14a; and electrode 15 on the upper edge thereof. A third electrode 30, extending parallel to electrodes 14, 15, is mounted on the outer flange of channeled member 28. Electrode 30 is horizontally aligned with electrode 15 and preferably, is electrically connected to electrode 14, by suitable conductor means, not shown.

As shown in Fig. 4, the tuning and coupling circuit, disposed in a suitable casing 31, may be directly attached to one sign unit, the output leads of the circuit being directly connected to electrode 15 and interconnected electrodes 14, 30. The other sign units may be provided with terminal blocks 32, as shown in Fig. 5, thus allowing short conductors 33 to suitably interconnect the two units making up a single sign assembly, and allowing one of the units to be disconnected, if so desired. A short cable 34 may be used to interconnect circuit 13 with the second sign assembly 12a.

In operation, switch 18 may be operated to connect the proper condenser in circuit, in accordance with the total load expressed as the number of letters 16 actually in use on the sign assemblies 12, 12a. Thus, with not more than about 12 such letters, condenser 20 is connected in circuit; for from 13 to 25 such letters, condenser 21 is connected; for from 26 to 37 letters, condenser 22 is connected; and for 38 to about 50 letters, condenser 19 is connected in circuit.

As the number of sign assemblies in use is varied, condenser 23 is tuned accordingly, the illumination of pilot light 25 indicating optimum conditions.

The individual letters 16, formed of glass tubing and filled with ionizable gases, are mounted in suitable footings or bases 35 of dielectric material, which receive the tubulation or stems of the letters. The bases 35 are receivable in the channeled members 28 and slidable therein. Thus, the stems of the letters 16, being in close proximity to electrodes 15 and 30 are readily excited by the high frequency current applied to said electrodes, as more specifically described in said co-pending application Ser. No. 564,459.

As various changes might be made in the invention without departing from the spirit thereof, it is understood that all matter herein shown or described shall be deemed illustrative and not by way of limitation except as set forth in the appended claims.

Having thus disclosed my invention, I claim as new and desire to protect by Letters Patent:

1. For use with a luminescent sign comprising individual, movable electrical discharge tubes containing ionizable gases, and a pair of electrodes adjacent said tubes for exciting said tubes, a high frequency signal generator and a two conductor signal transmission means for coupling said signal generator to said pair of electrodes, the improvement comprising signal coupling means including an inductance means serially connected between a first conductor of said two conductor signal transmission means and a first electrode of said pair of electrodes, means for connecting the second conductor of said two conductor signal transmission means to the second electrode of said pair of electrodes, and capacitance means coupling the junction of said inductance

means and said first conductor to said second conductor.

2. Coupling means as in claim 1 wherein said capacitance means is variable to match the impedance values at the output of said generator and the input of said pair of electrodes.

3. For use with a luminescent sign comprising individual, movable electrical discharge tubes containing ionizable gases, and a pair of substantially linear electrodes adjacent said tubes for exciting said tubes, a high frequency signal generator and a two conductor signal transmission means for coupling said signal generator to said pair of electrodes, the improvement comprising a signal coupling means for coupling said signal transmission means to said pair of electrodes, said signal coupling means including inductance means serially connected between a first conductor of said signal transmission means and a first electrode of said pair of electrodes, means for connecting the second conductor of said signal transmission means to the second electrode of said pair of electrodes and capacitance means coupling the junction of said inductance means and said first conductor to said second electrode.

4. Coupling means as in claim 3 wherein said capacitance means is variable to compensate for variations in the effective length of said electrodes.

5. A sign as in claim 3 comprising a plurality of pairs of electrodes connected in parallel to said signal coupling means, wherein said capacitance means is variable in accordance with the number of pairs of electrodes in operative use.

6. A sign as in claim 5 wherein said signal coupling means includes a second capacitance means coupled between the junction of said inductance means to said first conductor and said second conductor.

7. A sign as in claim 6 wherein said second capacitance means is variable to match the impedance values at the output of said generator and the input of said pairs of electrodes in accordance with the number of tubes in operative use.

8. In combination, a luminescent sign comprising a pair of electrodes, a plurality of electrical discharge tubes adjacent said electrodes, a high frequency current generator, a coaxial cable means having an inner conductor and an outer conductor, means for connecting one end of said inner conductor to the output of said generator, means for grounding said outer conductor, an inductor connected in series between the other end of said inner conductor and a first electrode of said pair of electrodes, means for grounding the second electrode of said pair of electrodes, a first capacitor coupling the junction of said inner conductor and said inductor to ground, and a second capacitor coupling the junction of said inductor and said first electrode to ground.

9. The combination as in claim 8 including a plurality of pairs of linear electrodes in parallel relationship wherein said second capacitor is in shunt with said plurality of pairs of electrodes and is variable in accordance with the number of pairs of linear electrodes to compensate for variations in the effective length of said pairs of linear electrodes.

10. The combination as in claim 8 wherein said first capacitor is variable in accordance with the number of tubes to match the load presented by said tubes to the impedance of said generator.

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