

June 18, 1946.

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2,402,207

ELECTRICAL SYSTEM AND APPARATUS

Filed July 1, 1943

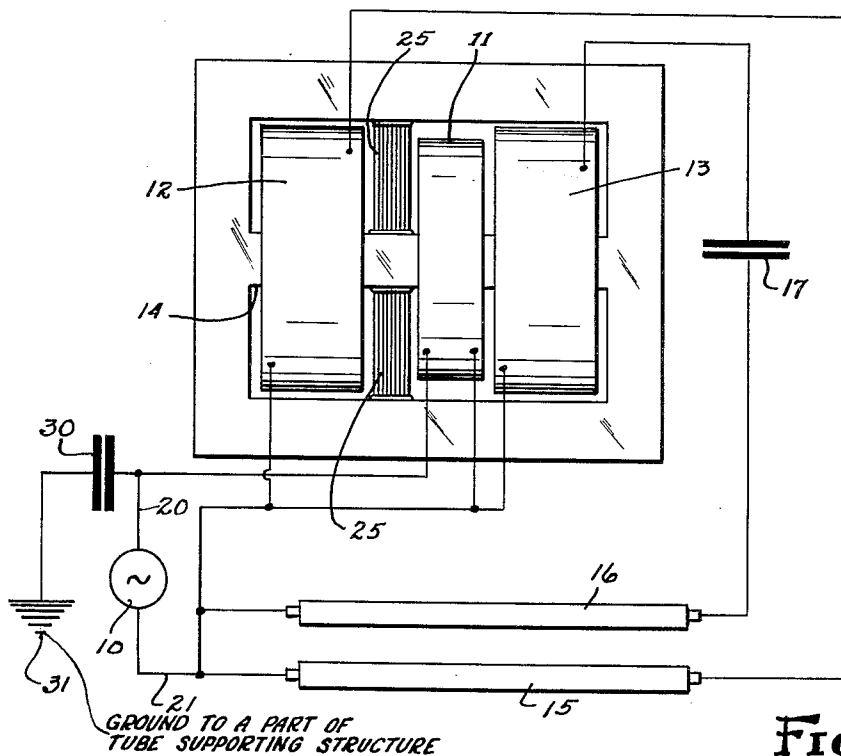


FIG. 1

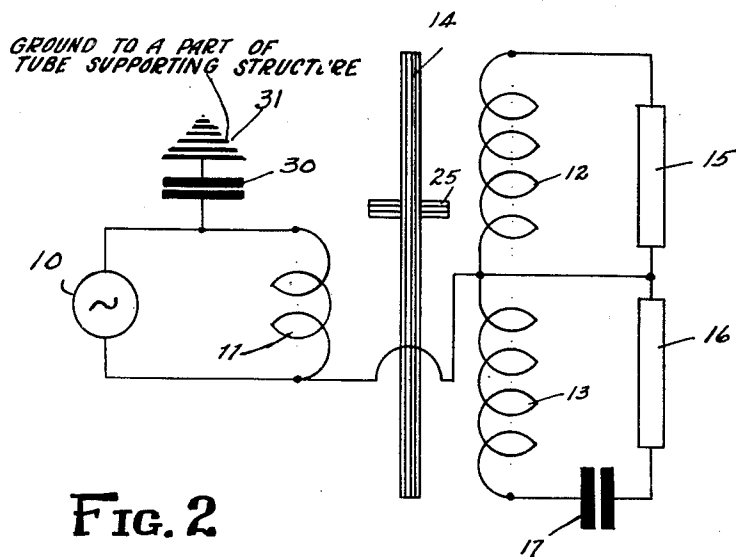


FIG. 2

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2,402,207

ELECTRICAL SYSTEM AND APPARATUS

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Application July 1, 1943, Serial No. 493,067

4 Claims. (Cl. 315—257)

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This invention relates to electrical apparatus, and particularly to that used for controlling and operating gaseous tubes, such as fluorescent light tubes. The invention embodies an improvement in the system illustrated in my copending application, Serial No. 435,449, filed March 20, 1942, now Patent No. 2,354,879 issued August 1, 1944.

Briefly, the system shown in the copending application embodies two fluorescent lamps mounted in a single casing or housing with a system of supplying energy thereto in a way which is so arranged that leading current is produced in one lamp and a lagging current is produced in the other, whereby the stroboscopic effect is minimized. In operating such system, however, I have found that certain difficulties are experienced under certain atmospheric conditions, in that the lamps would not light when the power unit was turned on. I am not as yet aware as to the exact reason for such phenomenon, but I have found that by means of the present invention, all such difficulties have been overcome.

The apparatus illustrated in my copending application includes a transformer core having a primary winding disposed between two secondary windings thereon, and having a magnetic shunt disposed between the primary and one of the secondaries, to the exclusion of the other secondary, for producing a lagging current in one of the tubes and having a capacitance connected in the other secondary circuit for producing a leading current in the other of said tubes. Such arrangement is substantially as illustrated in part of the drawing that forms part of this application, as will hereinafter be fully set forth.

Referring now to the drawing, Fig. 1 is a view illustrating my invention in connection with the operation of two gaseous tubes; Fig. 2 is a wiring diagram.

In Fig. 1, I have shown a source of alternating current supply 10 which is arranged to energize a primary winding 11 of a transformer which has secondary windings 12 and 13 respectively. Preferably, the core is of the shell type with a central leg 14, and preferably all windings are mounted on the central leg. The secondary winding 12 is in circuit with a gaseous tube 15, while the winding 13 is in circuit with the gaseous tube 16. In the arrangement shown, one of the primary leads 20 is connected directly to the source of supply, while the other lead 21 provides a common conductor for the tubes 15, 16.

For the purpose of overcoming stroboscopic

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effects where two tubes are mounted in a single casing, I cause a lagging current to be produced in one of the tubes and a leading current to be produced in the other tube. The lagging current is obtained by utilizing a magnetic shunt 25 between the primary coil and one of the secondary windings, whereas a leading current is produced in the other tube by utilizing a capacitance 17 in the circuit leading from the other secondary winding to the tube. Accordingly, the last-named secondary winding can be disposed in close proximity to the primary, in fact as close as practical manufacturing tolerances will permit.

While the production of a leading current in one tube circuit and a lagging current in the other tube circuit results in the primary coil being operated at approximately unity power factor, and thereby produces a distinct saving in cost of construction, and an increase in efficiency of operation, by providing the best type of loading for the power source, as compared to a construction wherein an individual primary winding is used with each secondary winding, nevertheless, it has been found that under certain atmospheric conditions the lamps will not light when the power unit is turned on. I have found, however, that such difficulty is immediately overcome if a condenser is connected to the non-common primary lead 20 and is grounded, as for example, to the transformer case or to a part of the tube supporting structure as distinguished from a ground to earth. Such condenser is illustrated at 30, and the ground connection is indicated at 31. As shown in Fig. 2, the primary coil is wound additive with respect to each secondary coil.

As an example of the equipment suitable for carrying out the present invention, I have found that by utilizing a source of alternating current supply at 118 volts and 60 cycles, and by utilizing two standard 40 watt fluorescent tubes, satisfactory results can be obtained if the transformer has a core stack substantially 1" x 1" in cross section, with the primary coil embodying 510 turns of No. 22 wire, and two secondary coils, each having 2000 turns of #26 wire. Such voltage is sufficient to start the tube without the use of starting switches. The shunt 25 is sufficient in size to limit the current to approximately 370 milliamperes on short circuit, while the condenser 17 has a capacity of 1.75 microfarads. Such transformer will result in a current of approximately 380 milliamperes in the condenser or leading current circuit, and approximately 360 milliamperes in the shunt or lagging current circuit.

With such transformer and tubes and source of supply, I have found that satisfactory results are obtained if the condenser 30 has a capacity of .005 microfarad.

An important advantage of the improvement set forth in the present invention is the fact that starting switches with their objectionable moving parts and requirement for maintenance are eliminated, that the tubes are operated in a non-stroboscopic way that the system is operated at substantially a unity power factor, that the transformer is reduced in size over an arrangement having a primary and secondary coil for each tube circuit, and that the lamps are started instantaneously upon energization of the transformer. The present invention has eliminated all starting difficulties which were accompanied by certain atmospheric conditions.

I claim:

1. A device for use in a luminescent tube lighting system which includes a gaseous luminescent tube and a supporting structure therefor, a source of alternating current supply, said device including a transformer having a core, a primary winding and a secondary winding on said core, said primary winding being adapted to be connected to said source of supply, and said secondary winding being adapted to be connected to said tube, said supporting structure including a transformer case, means for grounding one end of the primary winding to a part of the supporting structure, means for connecting the other end of the primary winding to one end of the secondary winding so as to attain additive voltage between the extremes of the primary and secondary windings, and a condenser in circuit with one of said means.

2. A device for use in a luminescent tube lighting system which includes at least two gaseous luminescent tubes and a supporting structure therefor, a source of alternating current supply, said device including a transformer having a core, a primary winding and at least two secondary windings on said core, said primary winding being adapted to be connected to said source of supply, one of said secondary windings being connected to one of said tubes, and the other secondary

winding being connected to the other of said tubes, said supporting structure including a transformer case, means for grounding one end of the primary winding to a part of the supporting structure, means for connecting the other end of the primary winding to one end of each secondary winding so as to attain additive voltage between the extremes of the primary and secondary windings, and a condenser in circuit with one of said means.

3. A device for use in a luminescent tube lighting system which includes a gaseous luminescent tube and a supporting structure therefor, a source of alternating current supply, said device including a transformer having a core, a primary winding and a secondary winding on said core, said primary winding being adapted to be connected to said source of supply, and said secondary winding being adapted to be connected to said tube, said supporting structure including a transformer case, said primary winding having one end thereof connected to said secondary winding so as to attain additive voltage between the extremes of the primary and secondary windings, a condenser connected to the other end of said primary winding, and means for grounding the condenser to a part of the supporting structure.

4. A device for use in luminescent tube lighting systems which includes at least two gaseous luminescent tubes and a supporting structure therefor, a source of alternating current supply, said device including a transformer having a core, a primary winding and at least two secondary windings, said primary winding being adapted to be connected to said source of supply, one of said secondary windings being connected to one of said tubes and the other secondary winding being connected to the other of said tubes, said supporting structure including a transformer case, said primary winding having one end thereof connected to one end of each secondary winding so as to attain additive voltage between the extremes of the primary winding and each secondary winding, a condenser connected to the other end of said primary winding and means for grounding the condenser to a part of the supporting structure.

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