

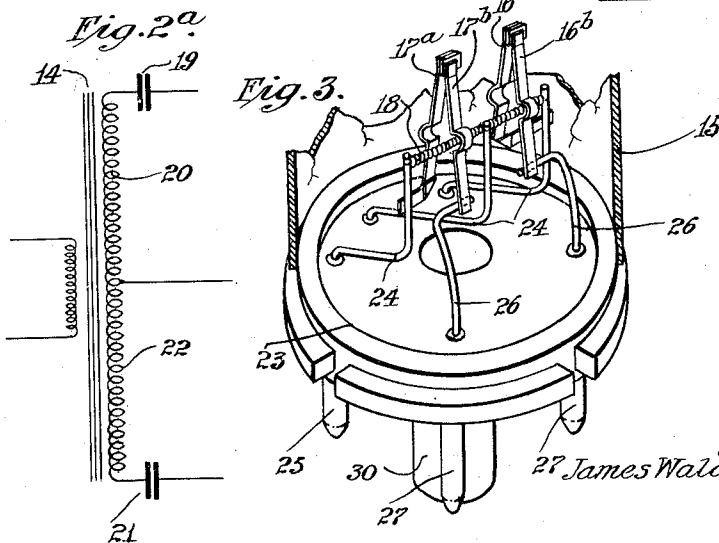
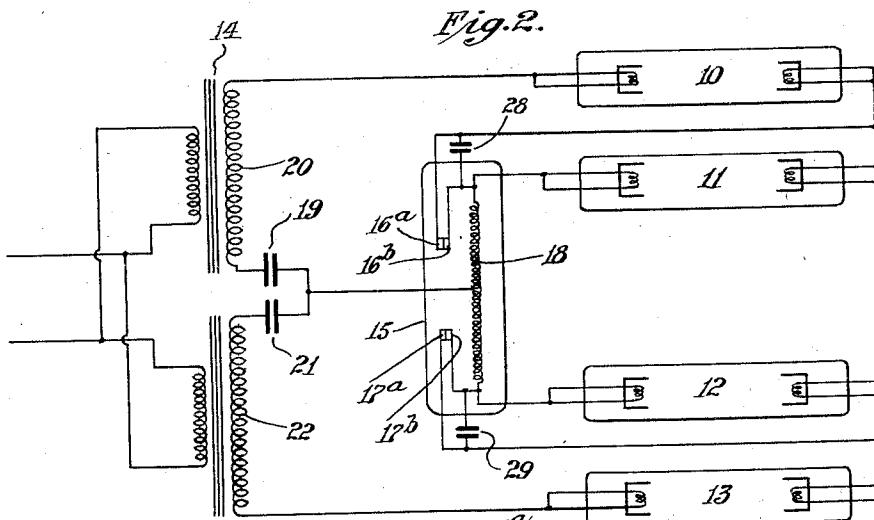
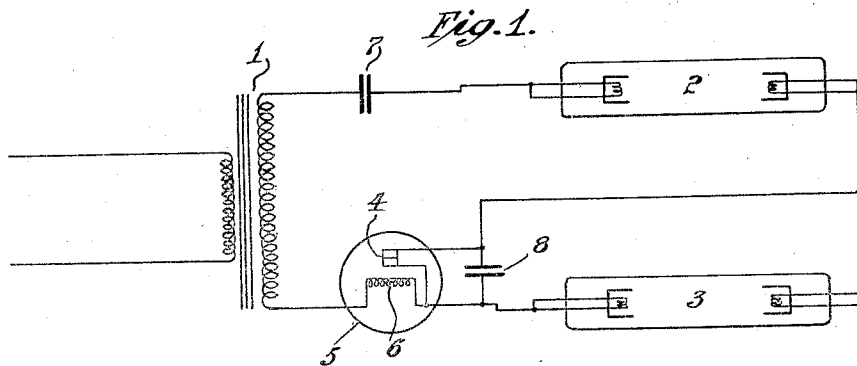
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FLUORESCENT GASEOUS DISCHARGE LAMP SYSTEM AND THERMAL STARTING SWITCH

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FLUORESCENT GASEOUS DISCHARGE
LAMP SYSTEM AND THERMAL START-
ING SWITCH

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This invention relates to electric gaseous discharge lamps and in particular to circuits for fluorescent discharge tubes starting at high voltages and operating with constant current transformers of the usual type.

One of the objects of this invention is to provide a novel, simple and efficient circuit arrangement whereby electric gaseous discharge tubes can operate efficiently, and where the secondary current will remain relatively constant in spite of the normal primary voltage variations encountered in service.

A further object is to obtain instantaneous starting in one or more lamps in a group, all operating in series, where no auxiliary transformers or inductance coils are required.

Still another object is to provide a simple balanced circuit using a constant current transformer adaptable to a wide variety of lamps.

Other objects, features and advantages will become apparent from the following detailed description of various embodiments of the invention as applied the schematic diagrams of which

Fig. 1 illustrates a two-tube circuit provided with a starting switch;

Fig. 2 a four-tube circuit with dual starting switches;

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ters and the voltage across the lamp drops down to a value of approximately 160 volts, for the 4 ft. tube, and 225 volts for the 6 ft. tube.

The current flows through contacts 4 and heating coil 6 which heats the bimetallic blades on which the contacts 5 are mounted, causing their opening. This opens the short circuit around lamp 3 and effectively includes it in the secondary circuit in series with lamp 2.

A condenser 7 provided in series with the lamp 2 improves the power factor and helps in starting the second lamp 3, and the bridging condenser 8 prevents sparking at the contacts.

The following is a tabulation of the significant data and results obtained:

Condenser 7—1 mfd.
Condenser 8—0.05 mfd.
Tubes 2 and 3:

Diameter—25 mm.
Length—4 ft.
Gas—Argon at 3½-8 mm.
Starting voltage—350-400 volts R. M. S.
Operating voltage—160-165 volts R. M. S. at 350 ma. tube current.
Light output—50 to 60 foot candle per foot (fc./ft.) at 350 wa. at 24 hours life.

Circuit data

Line Voltage R. M. S.	Line Current amps.	Total Watts	Power Factor	Tube Current ma.	Fc/ft.	Total Lumens	Lumens Watt
110	1.1	115	0.95	340	48	3,840	33.5
115	1.06	118	0.98	345	49	3,920	33.2
120	1.04	115	0.92	350	50	4,000	35.0
125	0.93	112	0.97	355	51	4,100	36.5

Fig. 2a a modification of Fig. 2; and
Fig. 3 is a perspective of the dual control thermostatic switch used in Fig. 2.

Referring to the circuit shown in Fig. 1, the customary neon sign tube, constant current transformer 1 of the high leakage, high reactance type (120 volts primary, 560 volts secondary, 360 ma. secondary short-circuit), or the equivalent, is used to connect fluorescent tubes 2 and 3 with the power mains.

When the main switch in the primary is closed, the full voltage of the current in the secondary circuit is across lamp 2, lamp 3 being effectively short circuited in normally closed contacts 4 of a thermostatic switch 5. A very short time after the primary circuit is closed, the self-heating cathodes of lamp 2 of the type described in my Patent 2,244,070 become efficient electron emit-

Pressure is an important factor. In the above example, best over-all results were obtained at the higher values.

In prior systems in which gaseous discharge tubes were operated over constant current voltage transformers only a maximum of four feet of 25 mm. tubing could be connected because longer tubes caused the secondary current to drop below the best operating value of 300 ma. Furthermore, in such arrangements the power factor was only about .34 and only 27 lumens per watt were produced.

Fig. 2 shows a circuit diagram expanded to illustrate how this method of operation can be utilized to get dual operation from a single transformer having a center tapped secondary, shown in Fig. 2a, or two like transformers having substantially the same characteristics. In this case the ther-

mostatic switch has a dual control for each circuit and has a common lead to the midpoint of its heating coil. One half of the coil controls one circuit and the other half the second circuit.

Four tubes 10, 11, 12 and 13 are fed either by a single transformer 14 having a center tapped secondary or by two like transformers having the same characteristics.

The double thermostatic switch 15 has two sets of normally closed contacts 16a, 16b and 17a, 17b and a common heating coil 18. As shown in Fig. 3, the switch is mounted on a base 23 of insulating material. From this base project three stems 24 on which the resistance 18 is mounted, the stems being connected with plugs like 25 projecting from the base to the outside and through which connections may be established with the circuit. The lower half of heating coil 18 is straddled by the bimetallic switching contacts 17a, 17b and contacts 16a, 16b straddle the upper half of the coil. Contacts 17a and 16a are welded to two of the stems 24 and contacts 16b, 17b to stems 26, the latter connected with plugs 27. The switch may be enclosed by a cover 15 seated on the base 23. Contacts 16a and 16b are bridged by condenser 28, and contacts 17a and 17b by condenser 29. The base 23 is of the five-pin "octal" type having a keyed guide pin 30 so arranged as to make sure that the switch will be correctly seated in its socket and connected with the circuit. When the main switch in the transformer primary circuit is closed, lamps 10 and 13 will be started over the following circuits: Transformer secondary 20, lamp 10, contacts 16a, 16b upper half of coil 18, and condenser 19, and secondary 22, lamp 13, contacts 17a, 17b, lower half of coil 18, and condenser 21. As in Fig. 1, when the lamps start, the heating coil 18 will open the contacts 16a, 16b and 17a, 17b which will open the normal short circuit around lamps 11 and 12 and connect these in series with 10 and 13.

The values are the same as in Fig. 1. The two circuits are about 180° out of phase. The power factor is better than 90%.

The transformer 14 and the condensers 19 and 21 are enclosed in a shielded casing.

What we claim is:

1. In combination, a transformer having a primary and secondary windings, four gaseous discharge lamps, a thermostatic switch having a heating coil, divided into two halves, and two pairs of bimetallic contacts controlled by the two halves of the heating coil, respectively, a circuit including in series the secondary winding, two lamps, a condenser, and one half of the heating coil, a short circuit across one of the last mentioned two lamps over the bimetallic contacts adjacent said one half of the heating coil, a second circuit including in series the second secondary winding, the two other lamps, a condenser and the other half of the heating coil, and a short-circuit across one of the two last mentioned lamps over the bimetallic contacts controlled by the last mentioned half of the heating coil.

2. In combination, a constant current transformer having a divided primary and divided secondary winding, four fluorescent tubes each having two electrodes, a thermostatic switch having a heating coil and two pairs of bimetallic contacts controlled by the two halves of the heating coil, respectively, a circuit including in series one of the secondary windings, two of said tubes, one half of the heating coil and a condenser, a short-circuit across one of the last mentioned two tubes over the bimetallic contacts adjacent said

one half of the heating coil, a condenser bridging the last mentioned contacts, a second circuit including in series the other secondary winding, the two other tubes, the other half of the heating coil, and a condenser, a short-circuit across one of the two last mentioned tubes over the bimetallic contacts controlled by the last mentioned half of the heating coil, and a condenser bridging the last mentioned bimetallic contacts.

3. In a thermostatic switch, a base, connecting pins projecting from one side thereof, conductors connected with said pins projecting from the other side thereof, two bimetallic strips arranged to face one another with a space between them, and having one of their ends connected with and mounted on two of said conductors, the other ends of said strips having contacts and being free to move towards and away from one another, and a heating coil arranged in said space and connected to one of the last mentioned conductors and another conductor, one sector of the circumference of said coil being arranged to heat one of said strips and an opposite sector of said coil being arranged to heat the other of said strips.

4. In a thermostatic switch, the combination of a base, connecting pins projecting from one side thereof, conductors connected with said pins projecting from the other side thereof, a plurality of pairs of bimetallic strips, the strips of each pair being arranged to face one another with a space between them, and having one of their ends connected with and mounted on said conductors, the other ends of said strips having contacts and being free to move towards and away from one another, and a heating coil passing through the space between the individual strips of each pair and connected to certain of said conductors, one sector of the circumference of said coil being arranged to heat one strip of each pair on one side of said coil and an opposite sector of said coil being arranged to heat the strips of each pair arranged on the opposite side of said coil.

5. In a thermostatic switch, a base, five connecting pins projecting from one side thereof, five conductors connected with said pins projecting from the other side thereof, two pairs of bimetallic strips, the strips of each pair being arranged to face one another with a space between them, and each strip having one end connected with and mounted on a different conductor, the other end of each strip having contacts and being free to move towards and away from the corresponding end of its pair, a heating coil passing through the space between the individual strips of each pair so that each half of said coil is arranged between the individual strips of one pair, whereby one sector of the circumference of each coil half is arranged to heat one strip of one pair and an opposite sector of said coil half is arranged to heat the other strip of said pair, and a cover for said base enclosing said contacts, conductors and coil.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,313,575	Peters	Mar. 9, 1943
2,305,223	McCarthy	Dec. 15, 1942

(Other references on following page)

2,423,031

5

UNITED STATES PATENTS

Number	Name	Date
2,236,697	Peters -----	Apr. 1, 1941
2,294,191	Lord -----	Aug. 25, 1942
2,294,203	Peters -----	Aug. 25, 1942
2,297,258	Spanner -----	Sept. 29, 1942
2,300,963	Prescott -----	Nov. 3, 1942
2,268,512	McCarthy -----	Dec. 30, 1941

2,266,619
2,268,522
2,172,635

Number
368,161
419,173
391,242

6

Campbell -----	Dec. 16, 1941
Abbott -----	Dec. 30, 1941
Bechter -----	Sept. 12, 1939

FOREIGN PATENTS

Country	Date
Great Britain -----	Mar. 3, 1932
Great Britain -----	Nov. 7, 1934
Great Britain -----	Apr. 27, 1933