

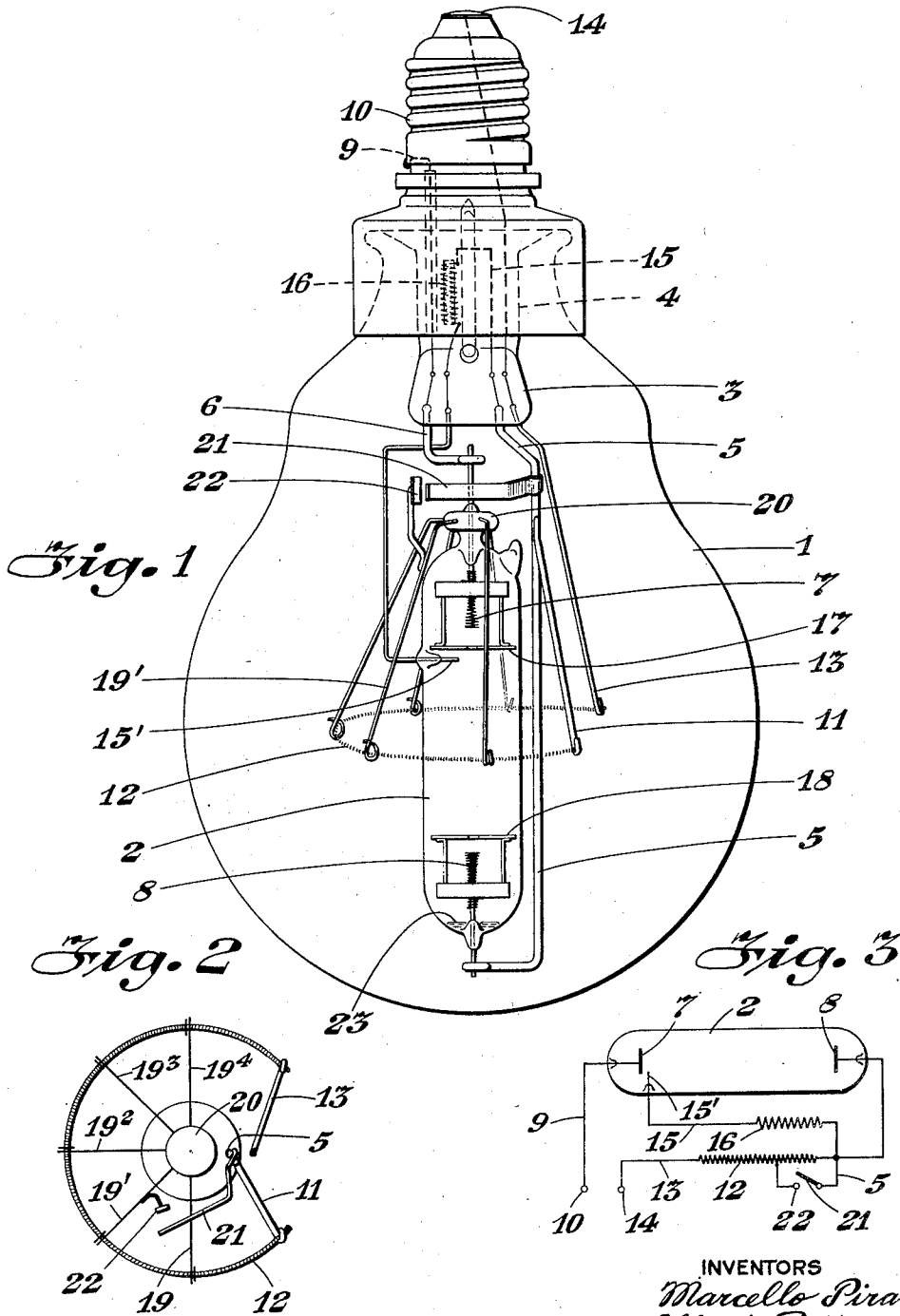
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GASEOUS ELECTRIC DISCHARGE ARC LAMP

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GASEOUS ELECTRIC DISCHARGE
ARC LAMP

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The present invention relates to gaseous elec-
tric discharge arc lamps generally and more par-
ticularly the invention relates to such devices in
which the arc voltage increases after the starting
of the lamp and reaches its full value after the
lamp has been operating an appreciable time.
One type of lamp having these voltage character-
istics is known in the art as a high pressure metal
vapor arc lamp.

Such lamps require a series resistance for the
successful operation thereof and the series re-
sistance can be in the form of an incandescent
filament mounted externally of the container of
the lamp. We have observed that in such a
circuit the voltage across the filament varies in-
versely with the arc voltage. Consequently,
when the filament is designed to be heated to
incandescence during the starting period of the
arc discharge the filament is not heated suffi-
ciently during the operating period of the lamp
when the arc voltage increases. On the other
hand if the filament is designed to be heated to
incandescence during the operating period of the
lamp the filament is overloaded during the start-
ing period when the arc voltage is low which
causes said filament to burn out to terminate the
useful life of the lamp unit.

The object of the present invention is to pro-
vide a lamp unit comprising a gaseous electric
discharge arc lamp having an incandescent fila-
ment connected in series therewith in which the
filament is heated to incandescence and not over-
loaded during the starting and operation of the
arc lamp in the lamp unit. A further object of
the invention is to provide an efficient lamp unit
of the above type. Still further objects and ad-
vantages attaching to the device and to its use
and operation will be apparent to those skilled
in the art from the following particular descrip-
tion and from the appended claims.

In accordance with these objects the new and
novel lamp unit comprises an arc lamp, a series
connected resistance in the form of a filament
therefor, means to connect into and disconnect
from the circuit a portion of said filament and
an envelope enclosing these elements. All parts
of the incandescent filament are connected into
the circuit during the starting period when the
arc voltage is low and a part thereof is discon-
nected from the circuit during the operating
period of the lamp when the arc voltage is high.
The incandescent filament is thus at full bril-
liancy and is not overloaded during the starting
and operation of the arc lamp. While many dif-
ferent types of time-delay switching means can

be used for switching a portion of the incan-
descent filament into and out of circuit we prefer
a bi-metallic strip which bends in response to
the heat generated by the arc lamp. While the
incandescent filament and the control means
therefor can be mounted in many positions with
respect to the container of the arc lamp we prefer
to mount these elements adjacent said container
in order to utilize the heat generated by the arc
lamp to operate the switching means and in
order to utilize the heat from the filament to
quickly raise to and maintain at its operating
temperature the container of the arc lamp. The
arc lamp and the incandescent filament thus
form an efficient lamp unit.

In the drawing accompanying and forming
part of this specification an embodiment of the
invention is illustrated but as such illustration is
primarily for purposes of disclosure it will be
understood, of course, that numerous changes in
the form and details of the device and in its use
and operation may be made by those skilled in
the art without departure from the broad spirit
and scope of the invention. In the drawing:

Fig. 1 is a front elevational view of the new
and novel lamp unit,

Fig. 2 is a plan view of the incandescent fila-
ment and the switch mechanism therefor, and

Fig. 3 is a schematic view of the lamp circuit.
Like figures denote like parts in all views of
the device.

Referring to the drawing the new and novel
lamp unit comprises a bulb shaped envelope 1.
The tubular container 2 of the arc lamp is
mounted inside said envelope 1. Said container 2
is supported by current leads 5 and 6 sealed into
the pinch-part 3 of stem 4 of the envelope 1
and sealed into opposite ends of said container 2.
A main discharge supporting electrode 7 of the
arc lamp is connected by leads 6 and 9 with the
screw-base 10 mounted on said envelope 1. One
end of a helically coiled, tungsten filament 12 is
connected to said current lead 5 of the other
main discharge supporting electrode 8 by lead 11,
the other end of said filament 12 is connected to
the button-contact 14 of the base 10 by lead 13.
The screw-base 10 fits into the conventional
screw-socket connected to the terminals of a
110 or 220 volt current source. Said filament 12
is concentric with and is in a plane at right
angles to the longitudinal axis of said container
2 mid-way between said electrodes 7 and 8. The
external end of said lead 5 is connected to the
lead 15 located in the stem 4 of the envelope 1.
Said lead 15 has a resistance 16 connected there-

in and said resistance 16 is mounted in said stem 4. Said lead 15 is reintroduced in said envelope 1 and is sealed into said container 2, the end 15' thereof terminating adjacent the electrode 7, as shown in Figs. 1 and 3. The end part 15' serves as an auxiliary electrode to facilitate the starting of the main arc discharge between said electrodes 7 and 8. Said electrodes 7 and 8 are electron emitting when heated and comprise a metal filament, such as a tungsten or nickel filament, coated or impregnated with an electron emitting material, such as barium oxide. It will be understood that we contemplate the use of other types of thermionic electrodes. Discs 17 and 18 of heat resisting material are connected to and are adjacent said electrodes 7 and 8 respectively and said discs 17 and 18 are interposed between said electrodes 7 and 8. The filament 12 is supported in said envelope 1 by rods 19, 19', 19², 19³, and 19⁴ fused into a glass knob 20 on the container 2, as shown in Figs. 1 and 2. A bimetallic strip 21 is mounted on said lead 5 and is adjacent one end of the container 2. A contact 22 for said bimetallic strip 21 is mounted on the support rod 19' of said filament 12.

Said container 2 has a gaseous atmosphere therein comprising a mixture of a gas and metal vapor, such as a mixture of argon and mercury vapor, or neon and sodium vapor, pool 23 indicating the source of the metal vapor. Said envelope 2 is filled with an inert gas, such as nitrogen or argon in accordance with the well known incandescent lamp practice.

When the above described lamp unit is connected to the terminals of a current source current flows through the lead 13, the filament 12, the lead 15, the resistance 16, the auxiliary electrode 15', to the main electrode 7 and thence over the leads 6 and 9 to the base 10. The auxiliary discharge which takes place between said electrodes 15' and 7 ionizes the gaseous atmosphere in said container 2 and the main arc discharge starts between said main electrodes 7 and 8 as soon as the gaseous atmosphere is sufficiently ionized. As soon as the main discharge is established in said container 2 the auxiliary discharge stops operating since the resistance in the discharge path between said electrodes 7 and 8 is less than the resistance of said resistance 16. The incandescent filament 12 is heated to incandescence on the starting of the auxiliary discharge which takes place when current is applied to the device. The lamp unit thus emits light immediately when the lighting circuit is made which is an extremely valuable feature of the new and novel lamp unit. The heat generated by the incandescent filament 12 and the discharges in said container 2 rapidly heats up said container 2 to its operating temperature. The vapor pressure of the metal in said container 1 rapidly increases to its operating pressure and the arc voltage likewise increases. The total length of the filament 12 is connected into the circuit during the starting period of the arc lamp when the filament voltage is high. The heat from said filament 12 and the heat from said container 2 heats the bimetallic strip 21 and said strip 21 bends more and more until contact is made between said strip 21 and the contact 22 which cuts out of circuit the portion of said filament 12 located between said rod 19' and said lead 11. This takes place at approximately the same time that the arc lamp reaches its operating voltage when the filament voltage is low. The other portion of the filament

12, that is, the portion thereof between said rod 19' and said lead 13 is thus at a high temperature during the operation of the arc lamp as well as during the starting of said lamp and consequently emits light of great intensity during these periods to supplement the light emitted by the arc lamp. It will be understood of course that when the lamp unit is shut off the bimetallic strip returns to its contact breaking position when it has cooled sufficiently and the above described operation takes place when current is again applied to the lamp unit.

The container 2 is heated during the operation of the device by the electric discharge therein and by the incandescent filament surrounding said container 2 and the radiation of heat therefrom is reduced to a minimum by the gas-filled envelope 1 which is made of heat absorbing glass, when desired. The container 2 is thus at a high temperature during the operation thereof which is of particular advantage in the type of lamp shown and described which is a high pressure mercury arc lamp in order to obtain a high metal vapor pressure. The high operating temperature of said container 2 is also of advantage when the vapor of a difficultly vaporizable material, such as an alkali metal, is used as a light giving element in order to obtain an effective metal vapor pressure.

The new and novel lamp unit is useful as a generator of light radiations having therapeutic value, such as ultra-violet rays, in which case the envelope 1 and the container 2 are made of a material, such as quartz, which transmits such radiations.

What we claim as new and desire to secure by Letters Patent of the United States is:—

1. A lamp comprising an envelope, a gaseous electric discharge lamp device mounted in said envelope, an incandescent filament in said envelope, a part of said filament being connected in series with said lamp device during the starting and operation of said lamp device, another part of said filament being connected in series with said lamp device during the starting thereof and means to short-circuit said last named filament part during the operation of said lamp device.

2. A lamp comprising an envelope, a gaseous electric discharge lamp device mounted in said envelope, an incandescent filament in said envelope, a part of said filament being connected in series with said lamp device during the starting and operation of said lamp device, another part of said filament being connected in series with said lamp device during the starting thereof and means responsive to temperature changes in said lamp device to short-circuit said last named filament part during the operation of said lamp device.

3. A lamp comprising an envelope, a gaseous electric discharge vapor lamp device mounted in said envelope, an incandescent filament in said envelope, said filament heating said lamp device during the starting and operation thereof, a part of said filament being connected in series with said lamp device during the starting and operation of said lamp device, another part of said filament being connected in series with said lamp device during the starting thereof and means to short-circuit said last named filament part during the operation of said lamp device.

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