

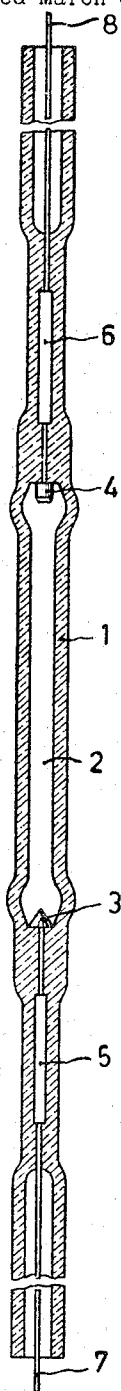
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SUPERHIGH-PRESSURE MERCURY VAPOR DISCHARGE LAMPS

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SUPERHIGH-PRESSURE MERCURY VAPOR
DISCHARGE LAMPS

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Continuation of application Ser. No. 355,667, Mar. 30,
1964. This application Mar. 13, 1967, Ser. No. 622,828
Claims priority, application Netherlands, Apr. 3, 1963,
291,092

4 Claims. (Cl. 313—228)

The present application is a continuation of application
Ser. No. 355,667, filed Mar. 30, 1964, now abandoned.

The invention relates to a superhigh-pressure mercury
vapor discharge lamp, that is to say a lamp in which dur-
ing operation with the prescribed load a pressure prevails
which exceeds 15 atmospheres.

Superhigh-pressure mercury vapor discharge lamps
nearly always comprise solid electrodes of a high-melting-
point conductor material, mostly tungsten, these electrodes
being spaced apart by a distance exceeding twice the small-
est inner diameter of the discharge space. Apart from
mercury vapor, the discharge space of these lamps con-
tains a small quantity of ignition gas, preferably a rare
gas or a mixture of rare gases. The wall of such discharge
lamps is always subjected to very heavy thermal load,
generally in excess of 300 w./cm.² of the inner surface,
as a result of which the temperature thereof becomes
very high during operation. In order to allow this high
load on the wall, two steps have been taken.

Firstly, the wall of the discharge space is cooled, for
example by means of a flow of water and, secondly,
quartz glass is used as material for the wall. With the
use of these steps, the temperature of the inner side of
the wall of the discharge space may exceed 600° C. with-
out the occurrence of a mechanical deformation of the
wall after the lamp has burned for a few hours.

The life of such lamps is generally limited by the instant
at which the lamp becomes leaky as a result of cracks
in the wall of quartz glass. These cracks are probably
due to variations in structure, possibly crystallization of
the quartz glass.

A superhigh-pressure mercury vapor discharge lamp
in accordance with the invention comprising solid elec-
trodes of a high-melting-point conductor material which
are spaced apart by a distance exceeding twice the small-
est inner diameter of the discharge space, and a quartz
glass wall surrounding the discharge space which is

loaded during operation with more than 300 w. per cm.²
of the inner surface, is characterized in that the discharge
space contains per cm.³ from 5×10⁻⁷ to 5×10⁻⁵ g.-atom
of at least one of the halogens.

It is known to introduce into mercury vapor discharge
lamps, having liquid mercury electrodes and a glass wall,
halides of metals, particularly of the alkali metals, in such
a quantity that the emitted light not only exhibits the
lines of the mercury spectrum, but also the lines of the
spectrum of the metal bound to the halogen, for example
alkali metal. It is said of these known lamps that the
glass wall is not attacked in contrast with lamps which
contain the said metals, for example alkali metals, but
which do not contain halogen.

It was found that with superhigh-pressure mercury
vapor discharge lamps, as already stated above, the lamp

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often becomes leaky due to cracks in the quartz glass en-
velope. If, according to the invention, a slight quantity of
halogen is introduced into the discharge space, either the
life time of the lamp is considerably lengthened with the
same load, or the load can be increased with the same
life time.

Since the introduction and dosage of halogen as such
into these very small discharge lamps is very difficult, the
halogen is preferably introduced into the discharge space
while being bound to an alkali metal. Consequently, the
discharge space contains per g.-atom of halogen 1 g.-
atom of alkali metal. However, the quantity of halide is
always so small that no lines from the elements bound
to the halogen are observable in the spectrum of the
emitted light.

Particularly satisfactory results are obtained with sodi-
um iodide and sodium bromide, since they are compara-
tively nonhygroscopic and since they substantially do not
raise the ignition voltage of the lamps.

The invention will now be described more fully with
reference to a few embodiments and to a drawing show-
ing a superhigh-pressure mercury vapor discharge lamp
in accordance with the invention.

In the drawing, reference numeral 1 denotes the quartz
glass bulb enveloping the discharge space 2. This dis-
charge space 2 comprises a cathode 3 and an anode 4
which both consist of tungsten. The electrodes 3 and 4
are connected through fusing strips 5 and 6 of molybde-
num to current supply conductors 7 and 8. The discharge
space 2 contains mercury, a rare gas and a halogen, for
example iodine.

A great number of lamps were manufactured in ac-
cordance with this drawing, different quantities of iodine
being introduced in the discharge space 2. The discharge
space of all lamps contained, apart from the iodine,
6.5×10⁻³ gms. of mercury and such a quantity of argon
that the pressure thereof was 60 mm. of mercury column
at room temperature. In all test lamps, the volume of
the discharge space was approximately 55×10⁻³ cm.³.
The lamps were fed with a pulsatory direct current of a
mean value of 2 A at a mean voltage of 400 v. and a pulse
frequency of 72 pulses per second. The iodine was intro-
duced into the discharge space while being bound to sodi-
um.

The table below indicates the mean life of the test lamps
as a function of the quantity of iodine in g.-atoms per
cm.³. Also the number of test lamps is indicated with
which the mean lifetime is determined for each quantity
of iodine.

Quantity of iodine.....	0.0	1×10 ⁻⁶	1×10 ⁻⁵	4×10 ⁻⁵	6×10 ⁻⁵	10 ⁻⁴	2×10 ⁻⁴
Number of measured lamps.....	9	4	11	6	7	9	10
Mean lifetime in hours.....	49	73	117	54	18	12	12

As already stated above, the iodine is introduced into
the discharge space in the form of sodium iodide. In the
spectrum emitted by the lamp, however, no lines of the
sodium could be observed.

The introduction of sodium chloride or sodium bromide
into the discharge space instead of sodium iodide result-
ed in an analogous lengthening of life.

What is claimed is:

1. A superhigh-pressure mercury vapor lamp compris-
ing an envelope having a quartz glass wall portion sur-
rounding a discharge space, electrodes within said en-
velope for producing a discharge in said space spaced
apart a distance exceeding twice the smallest inner diam-
eter of the discharge space, a supply of mercury within
said discharge space and an inert gas at a pressure at
which a discharge is produced between said electrodes

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which produces a load of at least 300 w./cm.² on the inner surface of said wall portion, and between 5×10^{-6} and 5×10^{-7} gram-atoms/cm.³ of a halogen in said discharge space whereby the life of said lamp is greater than the same lamp without the halogen and no spectral lines of an element bound to the halogen are emitted.

2. A superhigh-pressure mercury vapor lamp as claimed in claim 1 in which the halogen is present in the form of an alkali halide.

3. A superhigh-pressure mercury vapor discharge lamp as claimed in claim 2 in which the alkali metal is sodium and the halogen is selected from the group consisting of bromine and iodine.

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4. A superhigh-pressure mercury vapor discharge lamp as claimed in claim 3 in which the inert gas is argon.

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