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MONOCHROMATIC LIGHT SOURCE WITH TEMPERATURE REGULATING MEANS

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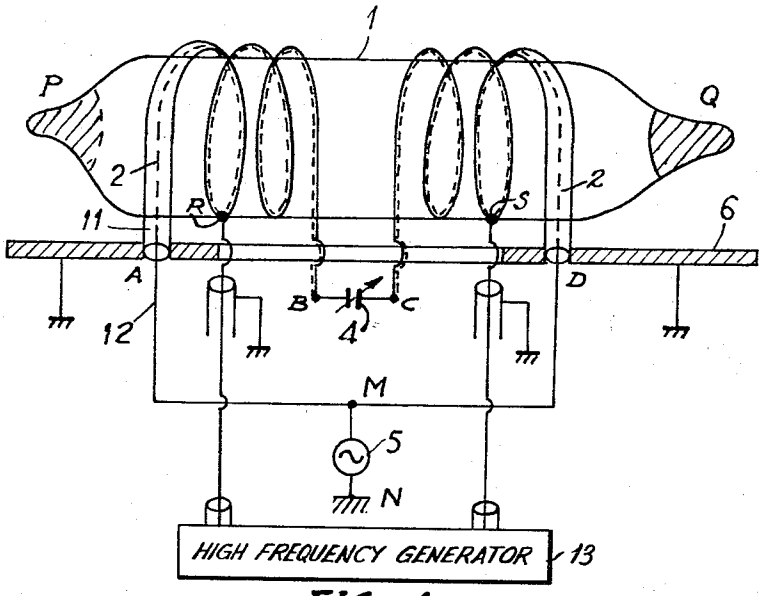


FIG. 1

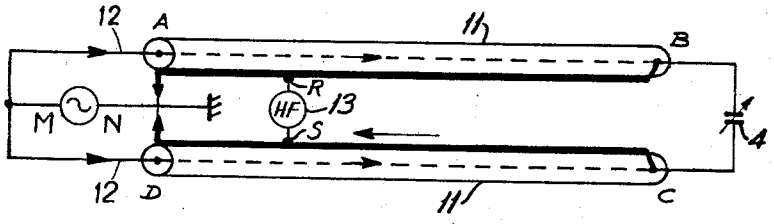


FIG. 2

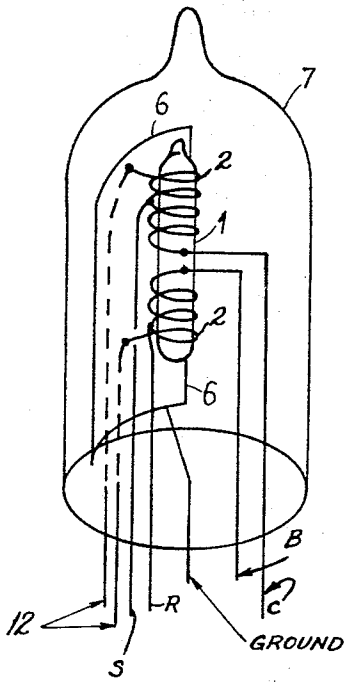


FIG. 3

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MONOCHROMATIC LIGHT SOURCE WITH TEMPERATURE REGULATING MEANS

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4 Claims. (Cl. 315—115)

Over the last few years many advances have been made in the production of sources of monochromatic light capable of supplying relatively fine spectral lines, which sources have been a matter of considerable interest in many fields of industrial physics.

This is, in particular, the case in colour television, where the primary colour characteristics are preferred to spectrum loci and in all applications using optical resonance methods.

In order to obtain sources of spectral light of high amplitude, it is known to utilize the discharge in a sealed luminescent bulb of a saturating vapour, of an alkali metal, such as caesium or rubidium. As is known, the luminous efficiency of this discharge is a maximum at a suitable, and often relatively high, temperature of the plasma.

Under these conditions it is necessary to heat the plasma from the ambient temperature, to reach the maximum efficiency temperature.

Part of the heat has of course, to be supplied by the excitation source whose electric field by Joule effect starts the heating of the plasma.

However, this source of heat is ill suited to the part it plays. Actually, it is very difficult to regulate the temperature obtained in this way.

Further, this heat is derived from a source of electrical energy whose cost is high on account of the necessity of having to transform an industrial current into a high-frequency current. It is thus appropriate to use a high frequency source of this type only for providing the power strictly necessary for starting the excitation process.

Under these conditions, the additional heat, necessary to obtain the optimum efficiency temperature, should be derived from a heating source supplying an industrial electric current.

The present invention has for object to provide such an auxiliary, low frequency heat source for heating a plasma bulb, in addition to the high frequency source, both sources using in common at least certain parts of their respective load circuits.

A monochromatic light source according to the invention includes heating wires which surround the bulb and are arranged in the form of turns conforming to the shape of the turns generating the high-frequency field, these heating wires being connected in series with these turns, which thus ensure the return of the heating current. Preferably they are positioned inside these turns, which are then hollow.

Moreover, the heating wires surround a definite zone of the bulb, so as to create in the bulb a heat gradient such that the alkali vapours are condensed outside of a zone which constitutes the active part of the bulb.

The invention will be better understood from the following description and appended drawings, wherein:

FIGURE 1 shows schematically a first embodiment of the invention;

FIGURE 2 shows schematically a detail of the arrangement of FIGURE 1; and

FIGURE 3 shows schematically another embodiment of the invention.

The same elements are designated by the same reference numbers throughout all the figures.

FIGURE 1 shows a bulb 1 filled with a saturated vapour of an alkali metal, such as rubidium or caesium. This bulb is surrounded in its central part by a hollow winding 2. The outer surface 11 of the winding is coaxially coupled at tapping points R and S, near its ends A and D which are close to those of the bulb, to a high-frequency generator 13 having an R.F. input and an R.F. output. The winding is divided in two parts connected together at B and C and by a tuning capacitor 4 for providing across its plates a high amplitude high frequency voltage.

A wire 12, which serves as a heating wire, is located inside winding 11; its terminals A and D are connected to a terminal M of a heating generator 5. It is connected at points B and C to conductor 11. The other terminal N of source 5 is grounded. The ends A and D of conductor 11 are also grounded through a metal conductor 6.

According to this arrangement, which is shown more diagrammatically in FIG. 2, the low frequency heating circuit comprises two branches in parallel, i.e., a branch MABN and a branch MDCN, with a tuning capacitor 4 between points B and C which has an infinite impedance at the heating low frequency. The high frequency circuit extends from point R through capacitor 4, to point S.

Since conductors 12 and 11 are respectively the inner and the outer conductors of coaxial cable 2, the low-frequency magnetic field generated by conductor 11 neutralizes the field generated by conductor 12. Accordingly, the source is free from any modulation of its wavelength by a magnetic field of low frequency induced by the heating circuit.

The windings which surround only the central part of bulb 1 create, at the remote ends P and Q of the bulb, conditions favourable to the condensation of alkali vapour. A strong high frequency excitation occurs in the central part of the bulb, since a high electric field is provided in the neighborhood of capacitor 4.

FIGURE 3 shows another embodiment of the invention. This arrangement contains all the elements of the arrangement of FIGURE 1. To avoid convection losses, bulb 1 is placed in a second evacuated glass bulb 7. Grounding plate 6 is placed inside bulb 7. The figure shows that all the leading out terminals are situated at the base of tube 7, appropriate connections being provided.

Of course the invention is not limited to the embodiments shown which were given solely by way of example.

What is claimed is:

1. A source of monochromatic light comprising in combination: an elongated tight enclosure containing a low pressure gas and having two ends; two windings surrounding said two ends, each of said windings comprising a hollow conductor; a capacitor connecting in series said hollow conductors; means for connecting said series connected hollow conductors to a high frequency source; inner conductors respectively positioned in said hollow conductors and insulated therefrom except at the ends where said capacitor is connected; and means for coupling a low frequency source to the other ends of said inner conductors and said hollow conductors.

2. A source of monochromatic light comprising in combination: an elongated tight enclosure containing a low pressure gas and having two ends, two windings surrounding said two ends, each of said windings comprising a first hollow conductor and a second conductor within said first conductor; means for coupling said hollow conductors to a high frequency source; and means for coupling said second conductors to a low frequency source.

3. A source of monochromatic light comprising in combination: an elongated tight enclosure containing a low pressure gas and having two ends; two windings surrounding said two ends; each of said windings comprising a

hollow conductor and an inner conductor; a capacitor connecting in series said hollow conductors; means for connecting said hollow conductors to a high frequency source; two terminals, said inner conductor and said outer conductor of each winding being connected in series between said two terminals; and means for connecting said two terminals to a low frequency source.

4. A source of monochromatic light comprising in combination: an elongated tight enclosure containing a low pressure gas and having two ends; two windings surrounding said two ends; each of said windings comprising a hollow conductor and an inner conductor; a capacitor connecting in series said hollow conductors; means for connecting said hollow conductors to a high frequency source; two terminals, said inner conductor and said outer conductor of each winding being connected in series between said two terminals; and means for connecting said two terminals to a low frequency source;

a second vacuum tight enclosure surrounding said windings and said tight enclosure; said second enclosure containing one of said terminals.

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