The present invention relates to a constant intensity monochromatic light source.

Fine, high-energy spectral lines are obtained by the luminous discharge of a plasma formed, for example, from the saturating vapour of an alkali metal, excited by a high-frequency field and maintained at high temperature.

Such sources have the form of a small glass vessel containing a neutral gas and a saturating vapour of an alkali metal. The ionization is produced by an excitation device, formed, for example, by an assembly of coils surrounding the vessel and wherein a high-frequency current flows providing a high-frequency magnetic field inside the vessel.

The energy required in the cold state to strike the discharge in the neutral gas is generally very much higher than that required for maintaining the ionization of the vapour of an alkali metal when the optimum operating temperature has been reached.

As a consequence, the nominal power of a generator supplying the high-frequency current to the excitation device has to be much higher than that necessary for maintaining the ionization of the vapour of an alkali metal. Moreover, the impedance caused by the excitation device associated with the vessel containing the plasma is not constant, and the generator contains therefore circuits for limiting the power supplied by it.

It is an object of this invention to provide a new constant intensity monochromatic light source, which requires a reduced striking energy input.

According to the invention, there is provided a source of monochromatic light comprising: a bulb, filled with xenon and containing an alkali element; and means for submitting said bulb to a high-frequency ionization field.

For a better understanding of the invention reference will be made to the drawings accompanying the following description the only figure of which, shows an embodiment of the source according to the invention.

The drawing shows a closed envelope, for example, a glass tube, containing a mixture of a neutral gas and an alkali metal vapour. The two ends of the tube are surrounded by two identical windings 3 and 4, connected in series through a capacitor 5, whilst the other end of each of these windings is grounded at 23 by means of conductors 20 and 21. The assembly of the coils 3 and 4, and of the capacitor 5, forms an oscillating circuit, the advantages of which have been described in the United States Patent 3,230,422.

The tube 1 contains an alkali metal in the solid state and xenon, which later requires an energy for starting the high-frequency discharge of the same order of magnitude as that necessary for maintaining the ionization of the alkali metal vapour.

The oscillating circuit comprises taps 7 and 8, located, respectively, on the windings 3 and 4, and is supplied by a high-frequency generator 26 between the tap 7 and earth 23.

The earth 23 may be formed, for example, by a brass plate, on which are wound flat heating resistances.

The assembly consisting of the glass tube 1, equipped with the oscillating circuit and of the earth 23, is placed into a thermostatically controlled chamber 25.

The generator 26 comprises a transistor 11 whose collector 22 is connected through a choke coil 13, on the one hand to an output 19 of a D.C. source, whose other output is grounded, and on the other hand to the earth 6 through a bypass capacitor 12.

The emitter 27 of the transistor 11 is connected to the tap 7 of the coil 3. The base 14 of the transistor 11 is connected on the one hand to the tap 8 of the coil 4 of the oscillating circuit through reactance coil 9 in series with a capacitor 10, and on the other hand to a common point 24 of an impedance bridge through a reactance 15.

The said impedance bridge comprises a resistor 18 connected between the output 19 of the D.C. source and the point 24. This point 24 is connected to earth 6 via an assembly, consisting of a resistor 17 connected in parallel with a capacitor 16.

The said generator and the said oscillating circuit form an oscillator whose feedback loop is a dipole, comprising a reactance 9 in series with the capacitor 10.

The presence of this reactance 9 in the feedback loop makes it possible to regulate the phase shift produced by this dipole and facilitates electrical adjustments, for example, the high-frequency energy supplied to the excitation device associated with the tube 1.

The operation of the monochromatic light source with constant intensity according to the invention is as follows:

The use of xenon makes it possible to obtain the striking of the light source in the cold state with the same amount of high-frequency energy as that necessary for maintaining the discharge, in the alkali plasma at the optimum working temperature.

Since the frequency used is of the order of 50 m.c./s., the impedances offered by the xenon and by the alkali plasma are of the same order of magnitude.

Hence, the load formed by the oscillating circuit surrounding the tube which contains xenon and the vapour of an alkali metal, is always perfectly matched to the exciting generator, for all discharge conditions. Moreover, the electrical adjustment of this matching is less critical than in any other known solution.

This feature of the invention makes it possible to use a generator of particularly simple construction, which does not comprise power limiting circuits and is formed only of a power oscillator with a single amplifier stage, represented by the transistor 11.

The striking of cold xenon may be produced with a high-frequency energy of 0.6 watt. However, for obtaining a light of sufficient intensity, for example, for use in optical pumping, when the plasma of the alkali metal is excited, the high power energy is adjusted at 1.5 watts. Taking into account an efficiency of the oscillator of about 50 percent, the overall consumption of the arrangement is 35 watts. On the other hand, for maintaining the tube 1 at the optimum temperature for the plasma, an additional energy is supplied by the heating resistors surrounding the plate of the earth 23. This heating is
obtained by means of a direct current flowing through these wound heating resistors, which are so arranged that no parasitic fields are created. The calories are conducted towards the tube by thermal conduction of the turns of the excitation coils 3 and 4 which are connected to the earthing plate 23 by wires 20 and 21.

Of course the invention is not limited to the embodiment described and shown which was given solely by way of example.

What is claimed is:

1. A source of constant intensity monochromatic light comprising: a bulb filled with xenon and containing an alkali element; and means for submitting said bulb to a constant high-frequency electromagnetic ionization field.

2. A source as claimed in claim 1, wherein said bulb is an elongated bulb having a first and a second end; said means comprising a tuned circuit, formed of a first and a second coil respectively surrounding said bulb near said ends, and of a capacitor interposed between said coils; said coils being grounded at said ends and respectively comprising a first and a second tap.

3. A source as claimed in claim 2, wherein amplifying means are connected across said taps for forming with said tuned circuit an oscillator.

4. A source as claimed in claim 3, wherein said amplifying means comprise a bipolar transistor having an emitter, a base, and a collector; said collector being grounded, said emitter being connected to said first tap and said base being coupled to said second tap.

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JOHN W. HUCKERT, Primary Examiner
ANDREW J. JAMES, Assistant Examiner

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