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(54) IMPROVEMENTS IN OR RELATING TO RADIO FREQUENCY HEATERS FOR THERMOLUMINESCENT DOSIMETRY DISCS

(71) We, BRITISH NUCLEAR FUELS LIMITED, a British Company, of Risley, Warrington, Lancashire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to radiofrequency heaters and it provides in combination a radiofrequency heater suitable for heating thermoluminescent dosimetry discs and equipment for counting light emissions from the discs.

The present inventon consists in the combination of a radiofrequency heater adapted to receive thermoluminescent dosimetry discs, equipment for counting light emissions from said discs, and a digital timer controlling both the heating time of the heater and the counting time of the counting equipment.

In one form the heater of the invention comprises a pair of power amplifiers arranged in push-pull configuration, a stabilised power supply for the amplifiers with overload protection, a frequency-variable oscillator, driver tages for power amplifiers, and the digital timer.

The combination preferably also has a self regulating output control circuit for the power amplifiers with adjustability over a range of power outputs.

The invention will now be described by way of example with reference to the drawing accompanying the provisional specification, which is a block schematic circuit diagram of an RF heater unit according to the invention.

A light tight drawer 10 is used to receive personnel-carried thermoluminescent dosimetry discs. The drawer 10 has a light-guide output to a photomultiplier cell 11 and RF heating coils 12 are provided to heat the disc in the drawer 10. The coils 12 are switched on and off under control of a digital timer 13. The timer 13 also controls the counting time of a counter 14 connected with the cell 11. The counter has an output terminal 18.

The coils 12 are powered from push-pull amplifiers 15 which are driven from an oscillator and control box 16.

The oscillator is tunable to give a frequency range of 500 KHz to 1MHz, coarse and fine tuning controls being provided. The oscillator in box 16 responds to commands from the digital timer 13 so that these commands effect the switching on and off of the amplifiers 15 and hence the coils 12.

To obtain regulated output control of the amplifiers 15 an output control lead 17 is taken from one of the amplifiers to the unit 16 to provide negative feed back to regulate the power output of the amplifiers. The level of the power output from the amplifiers can be adjusted by a potentiometer in the feed back circuit.

The amplifiers 15 operate in Class B manner.

The digital timer takes a 50 Hz AC signal which is rectified and clipped to provide one input pulse every 10 mS. These pulses are subsequently shaped by integrated circuits acting as Schmitt trigger circuits. Further integrated circuits are used as "divide-by-10" circuits to give pulse trains with one pulse every 100 mS, one pulse every 1 S and one pulse every 10 S which can be set by 10-position digital switches. The operator sets the required time period in seconds on the digital switches. The timer counts the 10 mS spaced input pulses and when the number corresponds to the setting of the digital switches the timer switches off.

A control panel is provided having these controls:

Digital heat time set at coils 12
Digital On time set for cell 11
Digital Off time set for cell 11
Power set at coils 12

,Oscillator coarse and fine frequency controls
Start and Stop buttons
Tuning meter (located in the amplifier power supply)

A logic circuit is provided to effect predetermined control. For example, when the digital count sent out by the timer 13 reaches the heat time set at the control panel the heater is switched off by an appropriate command to the oscillator in box 16. Counters in the timer 13 are also reset. Similarly the timer 13 operates to reach the on/off times set for the cell 11 and ensures that counting cannot continue after heating is switched off and ensures that counting is off when the heater unit is first switched on. The logic circuit also provides that, with the stop button continuously depressed, the start button becomes an on/off button. The counting "ON" and counting "OFF" times are measured with respect to the beginning of the heating cycle and hence the counting period is accurately defined with respect to the heating period.

The unit has to be tuned. To do this, a typical thermoluminescent dosimetry disc is placed in the drawer and the power set on the control panel is placed at minimum and the heat is set for 30 seconds. The start button is then depressed and the oscillator frequency controls are adjusted to give a maximum current on the tuning meter. The stop button is then depressed. The heat time is then reset to the required heating time and the power to coils 12 set to give the required temperature rise at the discs to be counted. This temperature rise is a function of the type of dosimetry disc used. The heat time is decided by the length of time taken for all electrons to fall back to their ground energy state, giving out light. This time is a function of the temperature and of the material.

The power control is set to give the required temperature rise in the required heating time. A typical setting gives a 300°C temperature rise in ten seconds. Different settings are required for different types of disc, but the regulating circuit ensures consistent results when any one particular type of disc is used.

The counts from the counter together with disc identification information are taken to a tape recorder connected at terminal 18. Automatic identification, such as grooves providing binary information, can be used.

WHAT WE CLAIM IS:—

1. The combination of a radiofrequency heater adapted to receive thermoluminescent dosimetry discs, equipment for counting light emissions from said discs, and a digital timer controlling both the heating time of the heater and the counting time of the counting equipment.

2. The combination according to claim 1 in which the heater includes a pair of power amplifiers arranged in push-pull configuration, a stabilised power supply with overload protection for the amplifiers, and a control circuit arranged to maintain the power outputs of the amplifiers at a predetermined, though adjustable level.

3. The combination according to claim 2 including a variable frequency oscillator together with driver stages for the amplifiers.

4. The combination according to claim 2 or claim 3 including counting equipment substantially as hereinbefore described with reference to the drawing accompanying the provisional specification.

5. The combination of heater and counting equipment substantially as hereinbefore described with reference to the drawing accompanying the provisional specification.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*