

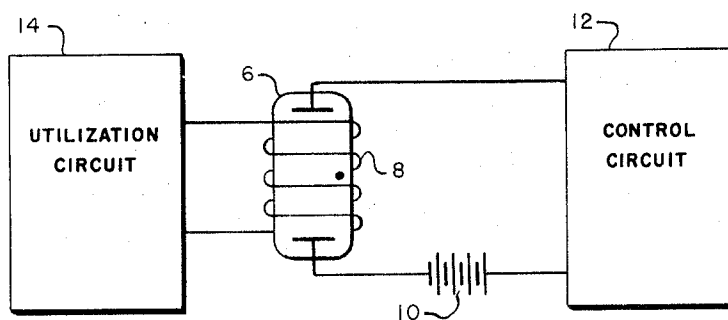
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INDUCTANCE VARIED BY CONTROLLED GASEOUS DISCHARGE

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INDUCTANCE VARIED BY CONTROLLED GASEOUS DISCHARGE

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment of any royalty thereon.

This invention relates to a tuning device. More particularly, this invention relates to a method of varying the inductance of a coil by a change in the permeability of its magnetic field.

Conventional methods of varying the inductance of a coil are usually based on mechanically varying the length and spacing of the coil or other physical characteristics or varying the position of a ferrous core within the coil. These methods of varying the inductance of a coil usually involve physical changes and are subject to mechanical instability.

It is an object of this invention to provide a means for varying the inductance of a coil.

It is a further object of this invention to provide a means for varying the inductance of a coil by a change in the permeability of the magnetic field of said coil.

It is a further object of this invention to provide a means for varying the inductance of a coil by a gaseous discharge tube activated within the magnetic field of the coil.

It is a further object of this invention to provide means of controlling an inductance from a remote position.

Other and further objects of this invention will become apparent from the following specification and drawing which shows a gaseous discharge tube positioned to control the inductance of a coil.

Referring now to the drawing, a gaseous discharge tube 6 is positioned within the coil 8 whose inductance is to be varied. The current through the tube 6 may be supplied by a battery 10. A current control device 12 may be any form of variable resistance or impedance known in the art and may include vacuum tubes and other similar techniques where higher gain or sensitivity is desired.

A utilization circuit 14 is shown across the coil 8. This circuit may represent any element requiring a variable inductance, for example, if a given frequency is to be varied, a suitable condenser may be supplied across circuit 14.

In operation, the increase in current through the gas causes an increase in the inductance of the coil. The current may be increased by decreasing the resistance of the control circuit 12 or increasing the voltage of the battery 10.

This method of controlling an inductance applies to any inductance having a magnetic path which can be made to include a gas. As a typical example, an air core coil could have an inclosed glass gas tube within the coil as shown in the drawing or positioned anywhere nearby the coil to provide a maximum or correspondingly less effect on the permeability of the medium through which the magnetic field of the coil passes. If the shape of the glass confining the gas is suitably chosen, the conductor can be wound around the bulb or even deposited on the glass to provide a high degree of mechanical sta-

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bility. It is also possible that the coil can be situated within the envelope of the gas tube when maximum ionizing effect is desired. Several separate gas containers with separate or a common source of current may also be provided.

It is not entirely the direct current through the gas that causes the change in inductance. The primary change appears to be caused by the ionization of the gas which is equivalent to a change in the dielectric of the medium affecting the coil. The change in the inductance will be proportional to the density of the gas and the degree of ionization as well as the size and shape of the magnetic field of the coil. The change in frequency possible by this method will depend on the circuitry as well as the change in the degree of ionization of the affected medium. A large change in frequency will be had by using a high inductance and a small capacitance while a large capacitance and a small inductance will give correspondingly less change in frequency for the same variation in the ionization of the gas tube.

With a change in the inductance, there is a corresponding change in the Q of the circuit. As the ionization of the gas goes up, the Q of the circuit goes down. This differs from the standard iron slug tuning wherein the Q of the affected circuit may go up or down depending on the slug structure and other circuit factors. This also differs from the standard capacitance tuning wherein the Q will vary with the frequency and the ratio of L to C.

The change in Q mentioned above may present both advantages and disadvantages, but it may be used advantageously for broad band IF transformer control where a small change in frequency can be tolerated along with the change in Q. Furthermore, this can be accomplished from a remote point which adds a very novel advantage. Another system of stagger tuning could also be employed which would change the Q without actually changing the center frequency. In this case, the adjacent identical coils could be tuned in opposite directions away from the center frequency broadening the band of IF transformer by the stagger tuning effect and the change in Q simultaneously.

The change in Q is proportional to the volume of gas, the density of ionization and other factors. The change in frequency associated with the change in Q will follow the general plan discussed earlier.

As a typical example of the control of inductance through a change in ionizing current, an NE-51 neon bulb placed in the core of a coil of a tank circuit at 40 megacycles having a Q of 115 will drop the frequency to 39.75 megacycles with an ionizing voltage of 67.5 volts reducing the Q to 95. It will drop the frequency to 39 megacycles at a Q of 72 when the ionizing voltage is raised to 90 volts. These figures show a relatively small change by way of indicating the function of this device using existing bulbs. For greater effects different gaseous bulbs, configurations and currents would be necessary.

This device would have obvious advantages for modulating an oscillator. The ionizing current in the discharge tube can easily be varied at audio frequencies and probably even at lower radio frequencies.

It is apparent from the teachings of this invention that other ionizable gases at various concentrations and ion densities would also be effective for controlling the inductance.

What is claimed is:

1. A source of current, a variable impedance control circuit, and a load connected in series, said control circuit varying said current from a maximum to a minimum value, said load consisting of a gaseous discharge device and an inductive circuit including a coil of wire wound around said gaseous discharge device and con-

trolled thereby, said coil having a first inductance when said current is maximum and a second inductance when said current is minimum.

2. A method of controlling the inductance of an electrical coil which comprises placing a gaseous medium within the magnetic field of said coil, passing an electrical current through said gaseous medium and varying the magnitude of said electrical current to control the inductance of said coil.

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