March 13, 1956 R. J. CASSUTT 2,738,471

POWER AMPLIFIER TUNING AND LOADING DEVICE

Filed April 4, 1952

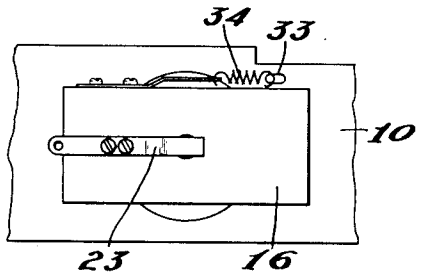


Fig 2

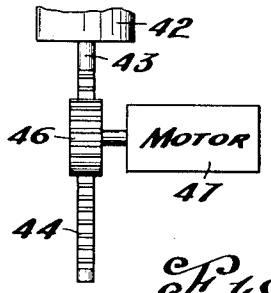


Fig 3

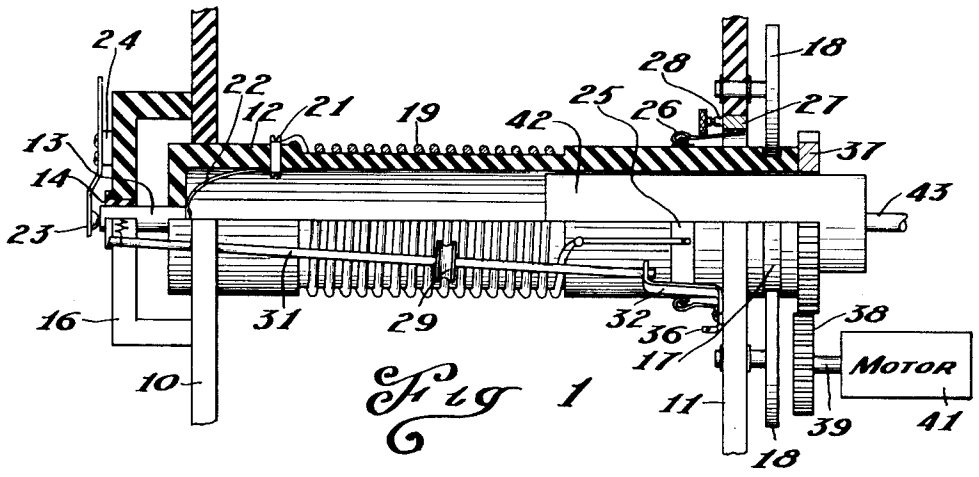


Fig 1

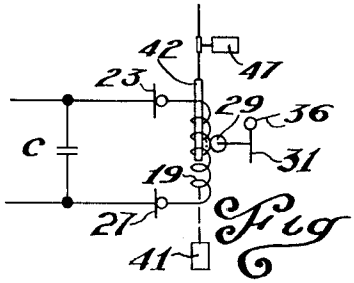


Fig 4

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POWER AMPLIFIER TUNING AND LOADING DEVICE

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1 Claim. (Cl. 336—30)

This invention relates in general to a variable inductor, and in particular to a variable inductor in which the number of turns and permeability may be independently adjusted.

It is oftentimes desirable in electronics to have an inductance which may be varied, as for example, in a tuned circuit where a capacitor and inductance are connected together, the frequency may be changed by varying the inductance. At the same time it may be desirable to match the impedance of an output from the tuned circuit so as to match an antenna or other network to which the circuit is connected. This requires that means be provided for varying the impedance.

It is an object of this invention, therefore, to provide an inductor which has a variable output contact and in which the effective inductance may be changed by moving a tuning slug relative to the longitudinal axis of the inductor.

Another object of this invention is to provide an improved variable inductor.

A feature of this invention is found in the provision for a rotatably supported coil form about which a coil is wound and which has a variable core that may be moved longitudinal of the coil to vary its effective inductance.

Further features, objects and advantages of this invention will become apparent from the following description and claim when read in view of the drawings in which:

Figure 1 is a side view of the variable inductor of this invention with a portion of the coil form removed so as to show the internal construction thereof;

Figure 2 is an end view of the variable inductor of this invention;

Figure 3 illustrates the driving means for varying the slug of this invention; and

Figure 4 is a schematic view of this invention.

As shown in Figure 1, a pair of end plates **10** and **11** rotatably support therebetween a coil form **12**. One end of the coil form **12** has a conducting axle **13** which is rotatably supported in a suitable bearing **14** mounted in an insulating bracket **16** attached to the end plate **10**. The other end of the coil form **12** is formed with a groove **17** into which four rollers **18** are received. The rollers **18** are rotatably supported by the end plate **11** and are equally spaced so as to provide a suitable bearing.

A spiral wire **19** is wound about the coil form **12** intermediate the end plates **10** and **11** and has one end attached to a terminal **21**. The terminal **21** is connected to the axle **13** by conductor **22** and a wiper contact **23** engages the end of the axle **13**. The contact **23** is supported to the bracket **16** by an insulated mounting **24**.

The opposite end of the coil is connected to a band **25** which has a wiper contact **26** connected to it. The wiper contact **26** engages a band **27** supported by the plate **11** about the coil form **12**. A terminal **28** connected to the band **27** forms the contact point for one end of the coil.

A roller **29** is rotatably supported on a conductive shaft **31** which has one end supported in a bracket **32**. The bracket **32** is attached to the end plate **11**. The opposite

end of the shaft **31** passes through a slot **33** formed in the end plate **10**. A spring **34** is connected to the shaft **31** and has its opposite end connected to the bracket **16**. It holds the roller **29** against the coil **19**. The bracket **32** has a terminal **36** at one end thereof from which an electric signal may be removed. The roller **29** is made of conductive material. The coil form has a gear **37** mounted at one end thereof which meshes with a gear **38** mounted on the output shaft **39** of a driving means **41**. Rotation of the coil form moves the roller **29** longitudinally of the coil because of the lead screw action.

The coil form **12** is hollow and receives therein a tuning slug **42** which is attached to a shaft **43**. As best shown in Figure 3, the shaft **43** is cut to form a rack **44** which meshes with a pinion **46** driven by a motor **47**.

In operation, the position of the roller **29** determines the number of effective turns supplied to the output terminal **36** and the position of the slug **42** varies the inductance of the coil.

Figure 4 is a schematic diagram of the coil showing the input and output contacts **23** and **28** and the variable pick-off contact **36** which is attached to the roller **29**. The slug **42** is driven by the motor **47** and varies the permeability in a well known fashion. The position of the contact **29** varies the impedance and thus, by moving it up and down, various values of impedance may be obtained. This allows an output or input circuit to be efficiently coupled to the coil.

The apparatus of this invention may be used in a circuit where it is desired to control the impedance between two points. For example, suppose a power amplifier is to furnish power to an antenna. It is well known that the load must be matched to the generator for maximum efficiency. Thus, no reflective components are desired. If the generator has a higher impedance than the antenna, it can be connected to terminals **23** and **28** and the antenna may be connected to terminal **36**. The opposite side of the antenna may be connected to ground. To vary the impedance ratio for correct matching, the roller **29** is moved relative to coil **19**. This forms an autotransformer. To control phasing the slug **42** is moved. This allows the reactive components to be cancelled.

Thus, simultaneous operation of motors **41** and **47** must occur to provide a perfect match between the load and generator. An adjustment of one element necessitates an adjustment of the other.

It is seen that this invention provides means for simultaneously varying the impedance and frequency of a tuned circuit.

Although this invention has been described with respect to a particular embodiment, it is not to be so limited as changes and modifications may be made therein which are within the full intended scope of the invention, as defined by the appended claim.

I claim:

An impedance matching inductor comprising a coil form, first and second bearing means located at opposite ends of said coil form, wherein the bearing means rotatably support said coil form, a coil wound on said coil form, first contacting means fastened at one end of said coil form and connected to the adjacent end of said coil, second contacting means fastened to the other end of said coil form and connected to the adjacent coil end, first and second wiper contacts supported respectively by said bearing means and engaging respectively the first and second contacting means, a rod supported between said bearings substantially longitudinally of and external to said coil form, a roller slideably supported by said rod and engaging said coil, a spring biasing said rod and roller toward said coil form to maintain engagement of said roller with said coil, a first motor, gear transmission means connected between the motor and said coil form

to rotate said coil and vary the position of the roller on said coil, a terminal connected to one end of said rod, a permeable slug slideably receivable within said coil form independently of rotation of said coil form, and a second motor connected to actuate the relative position of said slug within said coil, whereby independent operation of said first and second motors will adjust a wide range of impedance matching conditions between an input received across the coil and an output received between one end of the coil and the terminal.

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