July 27, 1926. 1,594,273

M. G. SATEREN

RADIOFREQUENCY TRANSFORMER

Filed July 20, 1925

Fig. 1.

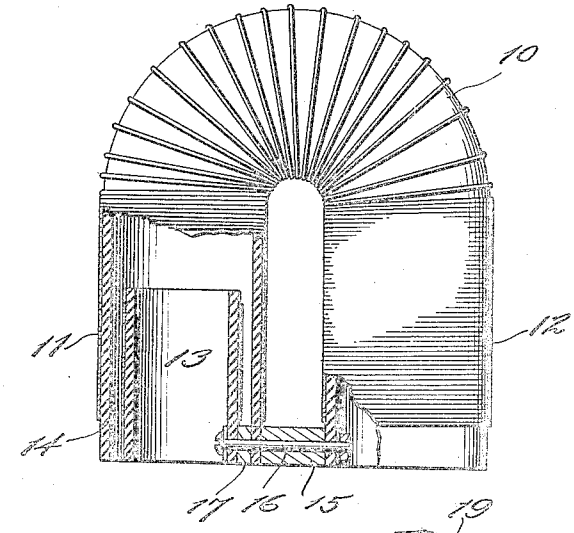


Fig. 2.

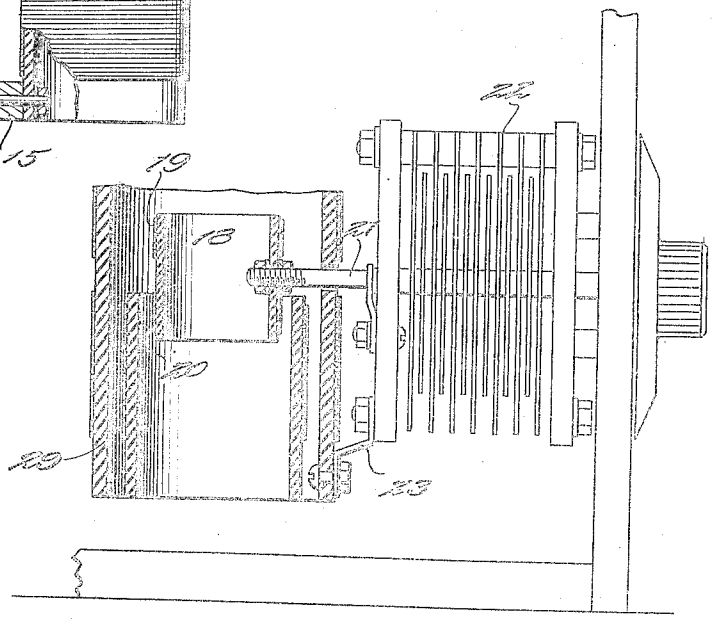
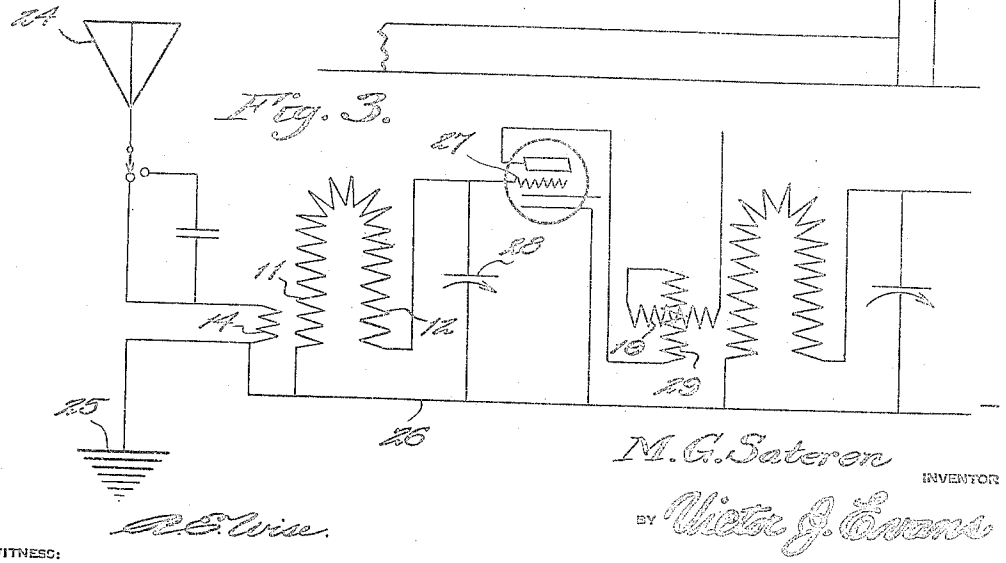


Fig. 3.



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UNITED STATES PATENT OFFICE.

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RADIOFREQUENCY TRANSFORMER.

Application filed July 20, 1925. Serial No. 44,862.

This invention relates to electrical apparatus for use in connection with radio communication and has for its object the provision of a novel transformer designed particularly for use in amplifying radio frequency currents, the arrangement and combination of parts being such that there will be a balanced effect so that the device will be entirely, or at least substantially, free from any magnetic pick-up due to the field of a coil placed near it.

An important object of the invention is to provide a transformer so constructed and designed as to avoid the induction of any voltages by passing waves from radio stations.

Another object of the invention is to provide a device of this character embodying means for varying the coupling and consequently increasing the sensitiveness and selectivity in addition to avoiding the reception of strays and the like, it being consequently possible to build up a multi-stage radio frequency receiver in which the danger of oscillation is almost entirely eliminated, the variability of the coupling moreover making it possible to secure uniform amplification throughout all the stages.

An additional object of the invention is to provide an instrument of this character which will be comparatively simple and inexpensive in manufacture, easy to use and adjust, positive in action, efficient and durable in service, and a general improvement in the art.

With the above and other objects and advantages in view, the invention consists in the details of construction and arrangement of parts to be hereinafter more fully described and claimed, and illustrated in the accompanying drawing, in which:—

Figure 1 is a side elevation, partly broken away and in section, illustrating the instrument,

Figure 2 is a fragmentary longitudinal section showing the device associated and connected with a variable condenser,

Figure 3 is a diagram of an electric circuit embodying a pair of the instruments.

Referring more particularly to the drawings I have shown the device as comprising a substantially U-shaped core or form 10 which has both legs and its bight portion wound with suitable wire or other conductor to define coils 11 and 12 which are continuous and which are a continuation of each other. The size of the wire and the number of turns is a matter to be determined by experimentation and depends to a certain extent at least upon the wave lengths or frequencies to be received. Mounted within one leg of the form or core is a cylindrical or straight core 13 bearing a coil 14. Any desired mechanical means may be provided for securing the parts though in Figure 1, I have shown a block 15 interposed between the legs of the U-shaped form and secured by a bolt 16 or the like which passes through the forms 10 and 13 and through a spacer 17 located between the form 13 and the adjacent portion of the form 10. The diameter of the form 13 with respect to that of the enclosing leg of the form 10 is a matter of choice and depends upon the desired closeness of coupling.

In Figure 2, I have shown a slight variation in which there is provided a third form 18 carrying a coil 19 connected in series and mounted upon a shaft 21 so as to be rotatable with respect to the other coils for varying the coupling. In actual practice the shaft 21 may be an extension of the shaft of an ordinary or any preferred type of variable condenser 22 and as a matter of mechanical detail the form 10 may be supported directly upon the condenser by means of suitable brackets 23.

In using the instruments, it is of course obvious that there are many circuits in which they may be employed to considerable advantage and in Figure 3, I have illustrated a circuit in which the numeral 24 designates an antenna which is connected with one terminal of the coil 14, the other terminal of the latter being grounded at 25 and also connected with the negative terminal of whatever source of current is used, as by a conductor 26. One terminal of the coil 11 is connected with the conductor 26 while the other terminal of the coil 12, which is a continuation of the coil 11, connects with the grid 27 of the amplifying tube. A variable condenser 28 shunts the coils 11 and 12 and is provided for adjusting purposes. This constitutes the first step of amplification and the second step is similarly arranged except that the modification disclosed in Figure 2

is employed. The coil 29 corresponding to the coil 14 is of course in series with the coil 19 of the rotary member 18 so as to define, practically, a variometer which is connected in the plate circuit.

In the operation it will be apparent that in the first step of amplification there is no need for any adjustment other than that afforded by the condenser whereas in the second step there is the condenser adjustment which simultaneously adjusts the rotary coil with respect to the stationary coil. I have discovered that this instrument acts in such manner as to be almost entirely free from any magnetic pick-up due to the field of a coil placed near it as the voltage induced in one leg of the coil will be balanced by the counter-voltage induced by the same field in the other leg of the coil. Similarly, this form of radio frequency transformer will not have voltages induced in it by passing waves from radio stations, for the same reason. It is thus possible to build multi-stage radio frequency receivers in which the danger of oscillation is almost entirely eliminated. By varying the coupling, that is increasing it as the wave length is increased, and vice versa, it is possible to obtain uniform amplification over the entire wave length range of the receiver. While a certain circuit has been illustrated, it should be distinctly understood that there is no limitation in this respect as it is obvious that many variations may be made as will readily be appreciated by one skilled in the art without further explanation.

While I have shown and described a preferred embodiment of the invention, it should be understood that I reserve the right to make such changes in the form, construction and arrangement of parts as will not depart from the spirit of the invention or the scope of the subjoined claims.

Having thus described the invention, I claim:—

1. A radio frequency transformer comprising a form including parallel portions and carrying a continuous coil about both portions, and a separate coil located within one portion of said coil in inductive relation to both.

2. A radio frequency transformer comprising a U-shaped core carrying a continuous coil extending about both legs and the bight portion thereof, and a core mounted within one of the legs of said core and carrying a coil.

3. A radio frequency transformer comprising a U-shaped core carrying a continuous coil extending about both legs and the bight portion thereof, and a core mounted within one of the legs of said core and carrying a coil connected in series with the first-named coil.

4. In a radio frequency transformer, a core including spaced parallel portions carrying a coil on both portions, a stationary core mounted within one of said core portions and carrying a coil, and a coil rotatably mounted within said second-named coil and connected in series therewith.

5. A radio frequency transformer comprising a U-shaped core carrying a continuous coil extending about both legs and the bight portion thereof, a stationary core mounted within one of the legs of said U-shaped core and carrying a coil in inductive relation to the first named coil, and a third core rotatably mounted within said second stationary core and carrying a coil connected in series with said second named coil.

In testimony whereof I affix my signature.

MARTIN G. SATEREN.