July 25, 1950 V. H. ASKE 2,516,287

TUNING UNIT

Filed May 12, 1948

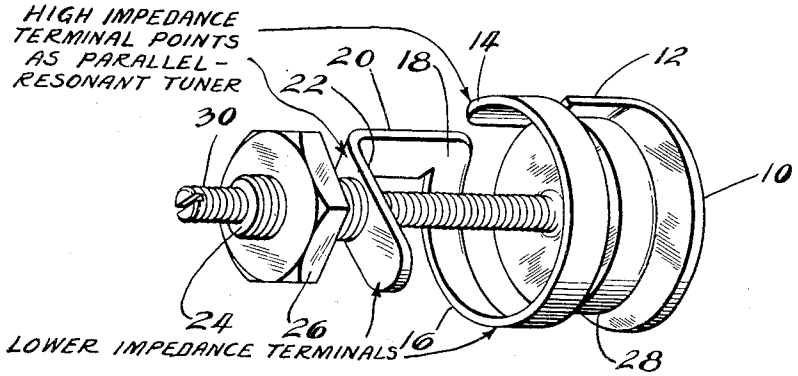


FIG. 1

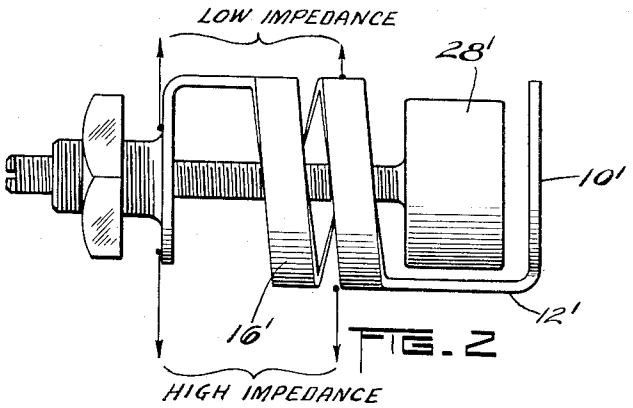


FIG. 2

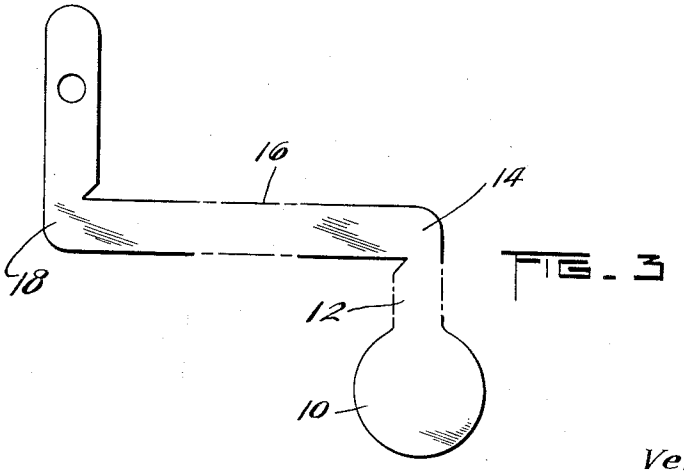


FIG. 3

INVENTOR.
Vernon H. Aske
BY A. B. Richardson
Attorney

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TUNING UNIT

Vernon H. Aske, Huntington Station, N. Y., assignor to Sylvania Electric Products Inc., a corporation of Massachusetts

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5 Claims. (Cl. 250—40)

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The present invention relates to tuning devices for high frequency radio circuits.

An object of the invention is to provide a novel compact and simple tuner adjustable over a wide frequency range and operable at frequencies of the order of 100 to 1,000 megacycles per second.

In accordance with the invention a self-supporting coil of one or more turns has an axial extension carrying a stationary condenser plate, and a metallic plug is supported for axial travel between extreme positions, within the coil and adjacent the condenser plate, respectively.

The following detailed disclosure of two illustrative embodiments of the invention will aid in a fuller appreciation of the invention and of its further objects and features of novelty. In the drawings:

Fig. 1 is a perspective view of a tuner embodying the invention, having a single-turn coil;

Fig. 2 is a lateral view of another novel form of tuner, having a one-and-a-half turn coil; and

Fig. 3 is a plan view of a sheet metal blank adapted to be formed into both the coil and the stationary condenser plate of the tuner in Figs. 1 and 2.

Referring now to Fig. 1, circular plate 10 is shown carried by axial strip 12 on one end 14 of a circular one-turn coil 16 the other end 18 of which is carried by angled arms 20 and 22 which constitute a mounting bracket. The parts described can be formed from a single piece of sheet metal cut to the shape in Fig. 3 and subsequently bent into the configuration shown in Fig. 1. This coil-and-condenser-plate structure is adapted to be secured to a supporting panel by externally threaded sleeve 24 and retaining nut 26, the panel being suitably apertured to admit the sleeve. A tuning plug 28 of brass is carried by a rod 30 having its bearing within sleeve 24, and is adapted to move between extreme positions, either adjacent plate 10 or within coil 16. The adjustment is effected by virtue of external threads on shaft 30 and threads within sleeve 24, in the form shown, although it is feasible to support tuning plug 28 in a slide bearing for endwise adjustment by any other suitable mechanism such as is commonly found in push-button tuners.

When plug 28 is adjacent plate 10 there is a maximum of capacity associated with the tuner, and the inductance is a maximum. When plug 28 is withdrawn from plate 10 into coil 16 the capacity of plug 28 and plate 10 as a two-plate condenser is reduced, and the inductance of coil

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16 is also reduced. Plug 28 acts as a short-circuited secondary winding reflecting capacity into coil 16 as a primary winding. There is a certain inherent capacity between the plug and the coil, which capacity is partly sustained as the plug leaves the coil by the proximity of plug 28 to arm 12. Where sleeve 24 and shaft 30 are of metal the tuner is useful as a parallel-resonant circuit with arm 22 as one terminal and point 14 or arm 12 as the opposite terminal. Coupling between this impedance and a lower-impedance line is effected by making connections to arm 22 and a tap along coil 16 determined empirically, or by an adjustable capacitive plate outside plate 10. Ordinarily the panel to which arm 22 is secured is a grounded chassis.

By adjusting principally the diameter of the coil, the diameter and length of the plug, and the sizes of plate 10 and arm 12, the center frequency and frequency range of the tuner in Fig. 1 can be widely varied. The following dimensions will be found to yield a parallel-resonant tuner having a substantially linear frequency-displacement characteristic between 500 and 650 megacycles per second; plug 28, $\frac{7}{16}$'' diameter; arm 12, ¼'' long; plate 10, ½'' diameter; length of strip between points 14 and 18, $1\frac{9}{16}$''; axial length of plug 28, ⅛''; width of strip in coil 16, $\frac{3}{16}$''; length of arm 20, ½''. The merit factor, Q, of the tuner thus constructed is remarkably constant over the tuning range, and is of the order of 160 for silver-plated parts.

In the form of tuner shown in Fig. 2, coil 16' has one and a half helical turns in place of the single circular turn in Fig. 1. Arm 12' and tuning plug 28' are axially extended for more complete coupling of the plug to the coil when the plug is positioned within that coil. With dimensions otherwise substantially equal to the tuner in Fig. 1, the tuner of Fig. 2 operates over a range of from 350 to 500 megacycles per second. Coil 16' and stationary condenser plate 10' are adapted to be formed from a single piece of sheet metal formed essentially as in Fig. 3, with the length of strip portions 12 and 16 properly adjusted.

Various detailed modifications of the forms disclosed above will occur to those skilled in the art. Therefore I desire the appended claims to be given broad interpretation, consistent with the spirit of the invention.

What is claimed is:

1. A tuner comprising a self-supporting electrically conductive cylindrical coil, an electrically conductive axial arm extending from said coil,

an electrically conductive plate extending from said arm across the axis of said coil, and a metal tuning plug supported for axial reciprocation between extremes, adjacent said plate and within said coil, respectively.

2. A high-frequency tuner comprising an electrically conductive cylindrical coil, a stationary condenser plate connected to one terminal of said coil and positioned across the end thereof but spaced from said end, and an endwise reciprocable metal tuning plug connected to the other end of said coil to adjust the frequency of said tuner from a lower limit with the plug adjacent said stationary plate and an upper limit with said plug spaced from said plate and within said coil.

3. A high-frequency tuner comprising a metallic bracket, a metallic sleeve secured to one arm of said bracket, a metallic cylindrical coil extending from the other arm of said bracket, a metallic arm extending from the opposite end of said coil, a metallic plate extending across the axis of said coil and forming a stationary condenser plate, a cylindrical metallic tuning plug, and a metallic rod having a bearing within said sleeve and joined to said plug and disposed along the axis of said coil to carry the plug from a position within the coil to a position near said plate, adjustably.

4. A tuner comprising a self-supporting metal cylindrical coil of approximately 1–1½ turns, a metal arm extending axially from said coil, a metal plate extending from said arm across the axis of said coil, and a metal tuning plug having a support effecting axial reciprocation of the plug between extremes, adjacent said plate and within said coil, respectively.

5. A tuner comprising a self supporting coil and condenser plate formed of a single piece of sheet metal, said piece including a strip of metal curved about an axis to constitute said coil and short lengths of metal extending laterally from the ends of said strip in opposite directions parallel to said axis, said short lengths having bent portions extending across the axis of said coil, one of said portions constituting a support and the other being enlarged to constitute a condenser plate, said tuner additionally including a metallic tuning plug, a metallic rod joined to said plug, and a rod bearing determining predetermined travel of said plug axially of said coil and with variable spacing from said condenser plate.

VERNON H. ASKE.

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