Nov. 2, 1937. J. C. GABRIEL ET AL 2,097,519

SIGNAL TRANSMISSION SYSTEM

Filed Sept. 5, 1935

FIG. 1

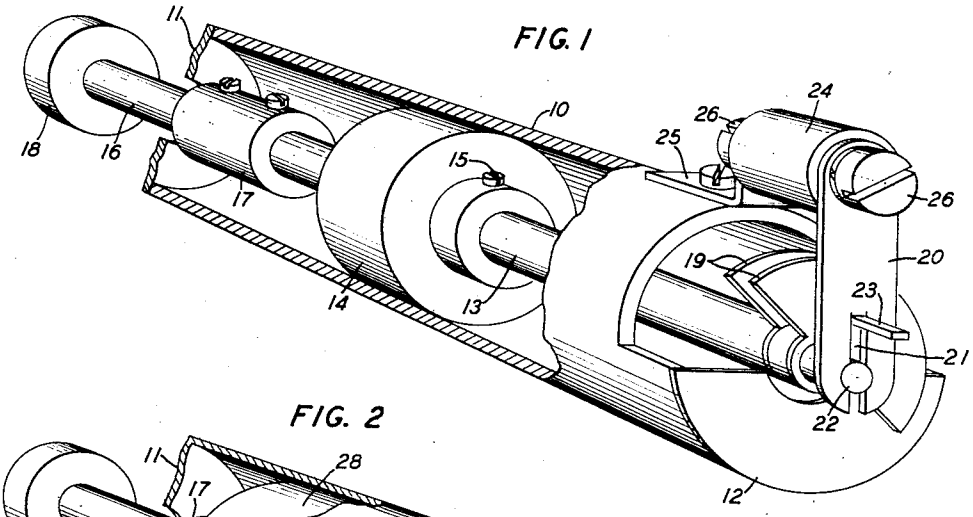


FIG. 2

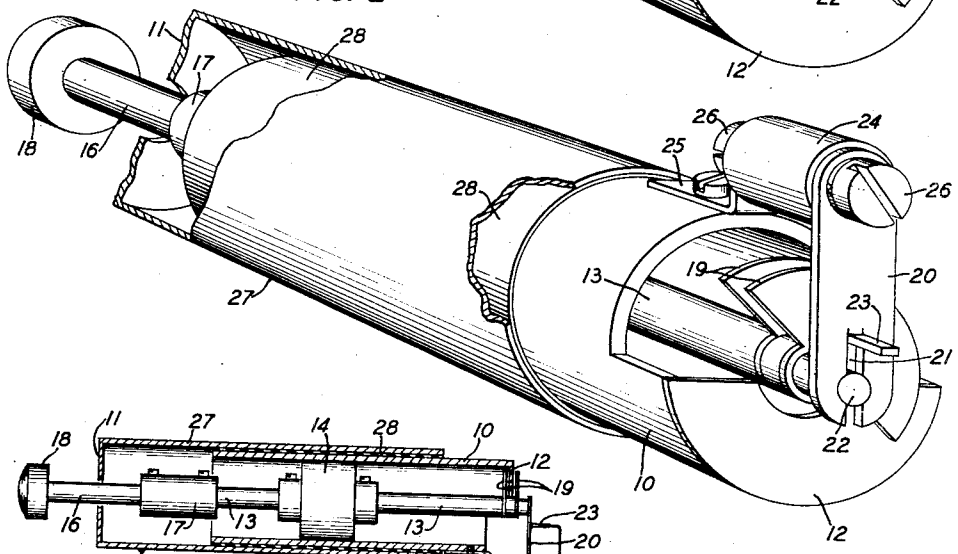
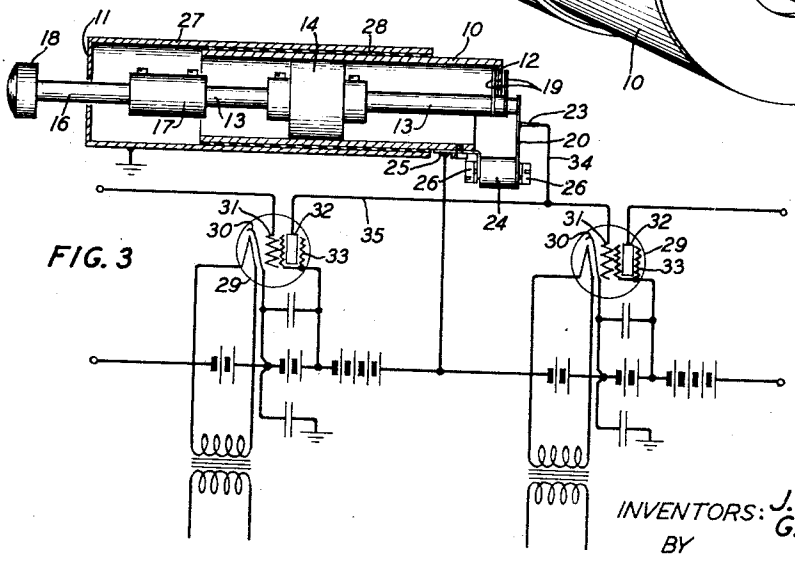


FIG. 3



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2,097,519

SIGNAL TRANSMISSION SYSTEM

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Application September 5, 1935, Serial No. 39,280

8 Claims. (Cl. 178—44)

This invention relates to signal transmission systems and more particularly to tuning devices for such systems adapted for use at ultra-high frequencies.

One object of this invention is to facilitate the tuning of a high frequency transmission system.

Another object of this invention is to simplify the structure and to increase the stability of operation of tuning devices for transmission systems.

In one illustrative embodiment of this invention, a tuning device comprises a metallic tubular member having a substantially semi-cylindrical plate at one end thereof. Disposed within the tubular member is a metallic rod, which preferably is coaxial with the tubular member and is rotatable about its longitudinal axis. The rod has slidably mounted thereon a short-circuiting member or plug which contacts with the rod and the tubular member and forms an electrical connection therewith. One or more plate members are mounted on the rod and are disposed adjacent and parallel to the semi-cylindrical plate at one end of the tubular member and form a condenser therewith.

The rod constitutes an inductive element, the active length, and hence the inductance, of which may be varied by sliding the short-circuiting member or plug along the rod. The plate and plate members constitute a condenser in shunt with the inductive element, the capacitance of the condenser being variable by rotation of the rod and hence of the plate members carried thereby. Although some distributed capacitance may exist between the metallic rod and the tubular member, because of the relatively short length of the rod and member, this capacitance is substantially negligible in comparison with the capacitance of the condenser formed by the plate and the plate members. The tuning device in accordance with this invention thus is similar to a resonant circuit of lumped constants.

In a modification of the embodiment described above, the tubular member may be encompassed by another tubular member, the two members being spaced by a dielectric material such, for example, as a sheet of mica, and forming a fixed condenser which may be used, for example, as a by-pass condenser to ground.

The invention and the features thereof will be understood more clearly and fully from the following detailed description with reference to the accompanying drawing in which:

Fig. 1 is a perspective view of a tuning device constructed in accordance with this invention, a portion of the tubular member being broken away to show details of structure more clearly;

Fig. 2 is a perspective view of a modification of the tuning device illustrated in Fig. 1, portions of the outer tubular member being broken away, and

Fig. 3 illustrates one typical application of tuning devices constructed in accordance with this invention, as an interstage coupling unit, the tuning device being shown partly in cross-section.

Referring now to the drawing, the tuning device shown in Fig. 1 comprises an elongated tubular or cylindrical member 10 having an apertured closure member 11 at one end and a substantially semi-circular plate 12 at the other end. The tubular member is of a metal having good electrical conductivity, such, for example, as copper or aluminum. Disposed within the tubular member 10 and coaxial therewith is a rod 13, which also may be of aluminum or copper. A cylindrical metallic member or plug 14 is slidably mounted on the rod 13 and slidably engages the inner wall of the cylindrical or tubular member 10. A set screw 15 may be provided for fixing the plug 14 in a particular position on the rod 13. Another rod 16, preferably of insulating material, is coupled to the rod 13 by a sleeve connector 17 and carries a knob 18 for facilitating rotation of the rods 13 and 16.

The rod 13 carries a pair of semi-cylindrical metallic plate members 19 which are disposed on opposite sides of the plate 12 and form a condenser therewith. An electrical connection to the rod 13 may be established through a metallic strip 20, preferably of copper, which is provided with a slot 21 having arcuate surfaces engaging a reduced extension 22 on the rod 13 and is provided also with an integral tab or lug 23 to which a conductor may be secured as by soldering. The strip 20 is supported from an insulating bushing 24 carried by a bracket 25 mounted on the tubular member 10, the bushing 24 having threaded taps for receiving screws 26.

In another embodiment of this invention illustrated in Fig. 2, the cylindrical or tubular member 10 is encompassed by a similar member 27, the two cylindrical or tubular members 10 and 27 being spaced by a dielectric material, as for example, by a sleeve 28 of mica.

As shown in Fig. 3, tuning devices constructed in accordance with this invention may be used as an interstage coupling unit, each stage comprising an electron discharge device 29 including, for example, a heater type cathode 30, a

control grid 31, an anode 32, and a screen grid 33. Suitable batteries are provided as shown for applying the requisite potentials to the various electrodes. The tubular member 10 is connected to the cathodes 30 and the strip 20 is connected by a conductor 34 to the conductor connecting the anode 32 of one electron discharge device 29 to the grid 31 of the electron discharge device in the next stage. The outer cylindrical or tubular member 27 may be connected to ground as shown.

It will be clear from Fig. 3, that the rod 13 constitutes an inductance and that the plate 12 and plate members 19 form a condenser in shunt with the inductance. The cylindrical or tubular members 10 and 27, together with the mica sleeve 28, form a by-pass condenser. The inductance of the rod 13 may be varied by sliding the plug member 14 along the rod to vary the effective length thereof. The capacitance of the condenser formed by the plate 12 and plate members 19 may be varied by rotating the rod 13. In the operation of the tuning device, the plug 14 may be fixed upon the rod 13 in a predetermined position, for example, approximately one-eighth wave length of the frequency it is desired to transmit, and the device may then be tuned to this frequency by rotating the rod 13.

It will be apparent that this invention provides a simple and compact tuning device which is structurally rigid and, therefore, insures stable operation. Furthermore, it may be noted that the cylindrical or tubular members 10 and 27 provide substantially complete shielding of the inductance element 13 so that faithful transmission between stages is assured.

Although specific embodiments of the invention have been shown and described, it will be understood, of course, that modifications may be made therein without departing from the scope and spirit of this invention as defined in the appended claims.

What is claimed is:

1. A tuning device comprising a pair of conductors disposed one within the other, the inner of said members constituting an inductance element, a metallic member slidably mounted on the inner of said conductors, said metallic member contacting with and electrically connecting said conductors, and plate members carried by and electrically connected to said conductors and forming a condenser.

2. A tuning device comprising a pair of conductors disposed one within the other and one of which constitutes the inductive element of the device, means for varying the effective length of said one conductor, and means including members integral with said conductors forming a variable condenser in shunt with said inductive element.

3. A tuning device comprising a tubular metallic member having a laterally extending plate portion, a metallic rod within said tubular member and constituting an inductive element, a metallic member slidably mounted on said rod and electrically connecting said rod to said tubular member, and a rotatable plate member mounted on and electrically connected to said rod, said plate member being disposed in juxtaposition to said plate portion and forming a condenser therewith.

4. A tuning device comprising a pair of coaxial conductors the inner one of which is rotatable and constitutes the inductive element of the device, means for varying the effective length of said inner conductor, a plate member integral with the outer of said conductors, and means including another plate member mounted on said inner conductor and rotatable therewith forming a condenser with said plate in shunt with said inductive element.

5. A tuning device comprising a pair of conductors disposed one within the other, the inner of said conductors constituting an inductive element, means on said conductors forming a condenser, and means adjacent one of said conductors and forming another condenser therewith, said means being insulated from both said conductors.

6. A tuning device comprising a pair of coaxial conductors the inner of which constitutes an inductance, means for varying the effective length of said inner conductor, means on said conductors forming a variable condenser, and another conductor forming another condenser with the outer of said coaxial conductors.

7. A tuning device comprising a pair of coaxial conductors the inner of which is rotatable and constitutes an inductance, means for varying the effective length of said inner conductor, a plate on the outer of said conductors, a plate member carried by said inner conductor and rotatable therewith, said plate and plate member being in juxtaposition and forming a condenser, and a tubular conductor encompassing the outer of said coaxial conductors and forming a condenser therewith.

8. A tuning device comprising a tubular metallic member, a rod within said member, said rod constituting an inductive element, adjustable means electrically connecting said rod and said member for varying the effective length of said rod, means carried by said rod and cooperating with a portion of said member to form a variable condenser in shunt with said inductive element, and another tubular metallic member encompassing said first tubular member and forming a condenser therewith.

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GEORGE RODWIN.

DISCLAIMER

2,097,519.—*John C. Gabriel*, New York, and *George Rodwin*, Randall Manor, N. Y. SIGNAL TRANSMISSION SYSTEM. Patent dated November 2, 1937. Disclaimer filed March 24, 1939, by the assignee, *Bell Telephone Laboratories, Incorporated.*

Hereby enters this disclaimer to claim 1 of said Letters Patent.

Hereby disclaims from the scope of claim 2 of said Letters Patent any tuning device as therein defined except such device wherein the means forming a variable condenser in shunt with the inductive element consists of members integral with the conductors disposed one within the other.

[*Official Gazette April 18, 1939.*]

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