

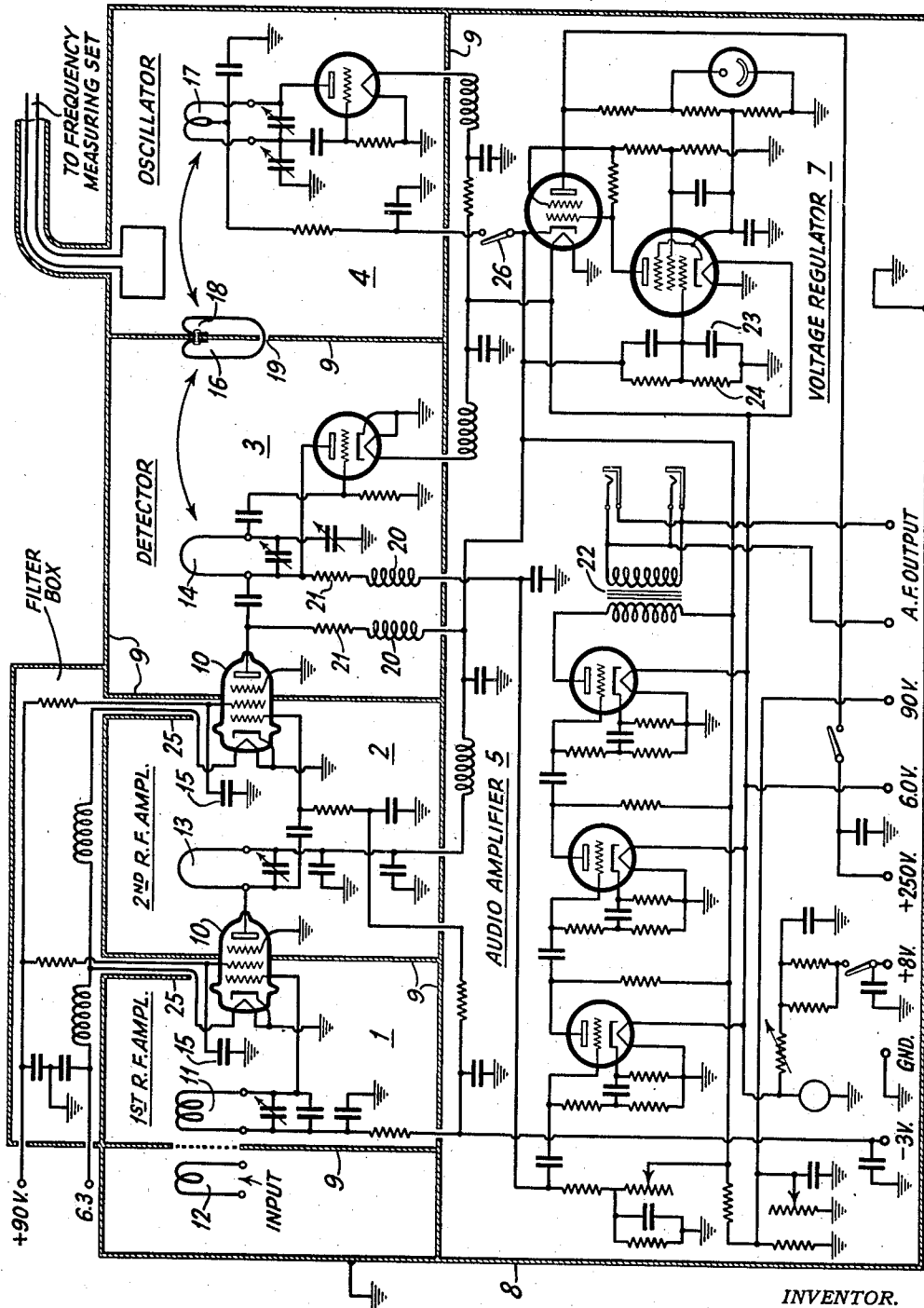
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ULTRA SHORT WAVE SYSTEM

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ULTRA SHORT WAVE SYSTEM

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9 Claims. (Cl. 178-44)

This invention relates to ultra short radio wave systems, and particularly to novel constructional arrangements therefor.

One of the objects of the present invention is to provide an ultra short wave radio receiving system wherein all stages are thoroughly shielded from one another, and wherein all parts are easily accessible from the front panel without obstruction due to the presence of the shielding partition.

Another object is to provide a highly efficient link circuit for magnetically coupling together two couplings coils of two tuned circuits. More specifically, it is an object to provide pure magnetic coupling between two circuits by means of a high Q transfer or link circuit which is devoid of the usual capacitance present in customary types of link circuits.

A description of the invention follows in conjunction with a drawing, whose single figure shows an ultra high frequency receiver and frequency measuring system. Although the invention is particularly described in connection with a frequency measuring system, it should be clearly understood that the novel features thereof are not limited either to a measuring system or to a receiver, but may be employed wherever there is need for the advantages provided by the circuits of the invention.

Referring to the drawing in more detail, there is shown an ultra high frequency receiver comprising first and second radio frequency amplifier stages 1 and 2, respectively, a regenerative detector 3, a local oscillator 4, and an audio frequency amplifier 5, all of which are appropriately labeled. There is also provided a known type of B supply voltage regulator 7 modified in a manner described hereinafter. The entire receiver is mounted within a grounded metallic container 8 which is divided into shielded compartments by means of metallic partitions 9, as shown.

The vacuum tubes of stages 1 and 2 comprise suitable acorn tubes 10, each of which is supported and mounted in the shielding compartment between these stages in such manner that the input circuit is isolated from the output circuit, as shown. Thus, the input circuit to the first radio frequency amplifier 1 comprises a parallel tuned circuit 11 suitably coupled to a source of oscillations 12 located on the opposite side of one of the shielding walls 9 while the output circuit of amplifier stage 1 comprises a parallel tuned circuit 13 coupled not only to the anode of the first tube 10 but also coupled to the

control grid of the second radio frequency stage. The output circuit of the second radio frequency amplifier 2 comprises a parallel tuned circuit 14 which constitutes the operating circuit of the detector stage 3. From an inspection of the drawing, it will be obvious that circuit 11, which is in one shielded compartment, is isolated from circuit 13, both of which in turn are isolated from circuit 14. The suppressor grids, the cathode and one side of the filament of each of the two amplifier tubes 10 are grounded, while the screen grids of these tubes are by-passed to ground through a suitable condenser 15, as shown.

The regenerative detector stage 3 comprises a vacuum tube to whose grid and cathode electrodes is coupled a parallel tuned circuit 14. The inductance of circuit 14 is of the plug-in coil type and is coupled to one side of a link or transfer circuit 16 to whose other side is coupled the inductance coil 17 of the local oscillator stage 4. By means of choke coils 20 in the detector circuit, and the resistances 21 in series therewith which prevent parasitic oscillations at frequencies determined by the inductances of the chokes, I have been able to provide a regenerative detector which requires only two terminals on the tuning inductance of the circuit 14.

The local oscillator 4 very generally follows the known type of three point Hartley oscillator, wherein the grid and anode are coupled to opposite sides of the inductance while the cathode is coupled to an intermediate point on the inductance. This oscillator may be energized at will by means of a plate supply switch 26 for purposes of calibration and frequency measurement.

The link circuit 16 comprises a single turn loop mounted on and supported by the partition between the detector stage 3 and the oscillator 4, such that one-half of the loop is coupled to tuned circuit 14 while the other half of the loop is coupled to coil 17, as shown. It should be noted that the single turn loop 16 is divided into two halves by means of the grounded partition 9, and that the both halves of the loop 16 are connected together at one point and to the grounded partition 9 at the binding post 18, while the other ends of the halves are integral and connected together through a small hole 19 in the partition 9 from which they are insulated. The link circuit 16 thus provides a highly efficient low loss (high Q) pure magnetic coupling transfer circuit between the detector and the oscillator. The degree of coupling depends upon the spacing between the link circuit 16 and the circuits 14 and

17, and also upon the size of the loop. Thus a larger loop for link circuit 16 will mean more coupling between the detector and the oscillator, while a smaller loop will mean less coupling between these two stages. One advantage of this type of link circuit is that it is particularly adapted for use on ultra high frequencies below five meters, especially so since it is devoid of the capacity which normally exists between the usual type of link circuit employing a pair of parallel wires between coupling loops; thus my link circuit may very efficiently transfer energy over a particular band of frequencies more efficiently than is possible by known types of transfer circuits.

The audio frequency amplifier 5 comprises three vacuum tubes, each of the RCA 6-F-5 type, the first stage of which is coupled to the anode of regenerative detector 3 while the last stage is coupled to the audio frequency transformer 22, in turn coupled to a suitable output circuit, here shown as a pair of jacks to which a loud speaker or telephone head-set may be coupled.

The B supply voltage regulator is an electronic type for stabilizing all of the B supply voltages and is similar to the circuit used in the type TMV-118B regulated power supply unit manufactured by the RCA Manufacturing Co., Inc., except for the use of an RCA type 6L6 beam power tube instead of the usual RCA type 2A3 type. It should be noted that there is added a small 0.02 mf. condenser 23 in shunt of the 50,000 ohm resistor 24 from the grid of the RCA type 77 tube to ground, in order to prevent a parasitic type of oscillation which sometimes occurs at super audible frequencies.

In order to cover a wide frequency range, the inductances of tuned circuits 11, 13 and 14 may be of the plug-in coil type. With a circuit of this type actually tried out in practice the receiver was built to cover a frequency range from 22 to 150 megacycles.

For achieving ready access to all of the tuned circuits without obstruction by the presence of the shielding compartments when the front panel of the receiving unit is removed, it is proposed to build the tuned circuits 11, 13, 14 and 17 on submountings attached to the front panel, and to couple the screen, cathode and heater supply leads to the tubes by means of clips which are built on the partitions of the shielding boxes. In this way the heater and screen voltages may be brought to the vacuum tube terminals through grounded metal ducts 25 which are bonded to the partitions of the box 8. It will thus be appreciated that the vacuum tube mounting is in fact a part of the shielding box. For removing the front panel and associated radio frequency circuits, it is only necessary to unclamp the plate and grid leads from the amplifier vacuum tubes 10 in order to allow these tubes to remain in their places in the shielding partitions.

In order to measure the frequency of any signal heard with this type of receiver, the oscillator 4 is adjusted so that a harmonic from it has the same frequency as the incoming signal by observing the condition of zero beat in the receiver output. The tuning of the detector circuit 3 is approximately calibrated in terms of dial reading and frequency, and the oscillator circuit is quite accurately calibrated in terms of dial reading and frequency. From these calibrations, it is readily possible to determine which

harmonic of the oscillator 4 is beating against the signal to give zero beat. An output connection is provided in the oscillator shielded compartment whereby the oscillator frequency can be transferred to one of the constant frequency measuring sets, not shown, and the oscillator frequency thus very accurately measured. The signal frequency is thereby accurately determined since it is only necessary now to multiply the exact frequency of the oscillator 4 by the order of the harmonic of the oscillator which is being used to beat against the signal.

What is claimed is:

1. The combination with a first inductance coil 15 located in a shielded compartment and a second inductance coil located in an adjacent shielded compartment, there being a shielding partition between said compartments, of a link circuit comprising a single turn coil one-half of which is located in the same compartment as said first coil and coupled thereto and the other half of which is located in the same compartment as said second coil and coupled thereto, said halves being separated by said partition and connected together through a hole therein.

2. The combination with a first inductance coil located in a shielded compartment and a second inductance coil located in an adjacent shielded compartment, there being a shielding partition between said compartments, of a link circuit comprising a single turn coil one-half of which is located in the same compartment as said first coil and coupled thereto and the other half of which is located in the same compartment as said second coil and coupled thereto, one end of one half of said single turn coil and the correspondingly located end of said other half of said single turn coil being connected to said partition, the other ends of said halves being connected together through a hole in said partition from which they are insulated.

3. An energy transfer circuit for magnetically coupling together two circuits separated by a shielding wall, comprising a single turn coil having parallel elements on opposite sides of said wall, one of said parallel elements being coupled to one of said circuits while the other of said parallel elements is coupled to the other of said circuits.

4. An energy coupling circuit for magnetically coupling together two circuits separated by a shielding partition, comprising a fraction of a coil located on one side of said partition and coupled to one of said circuits, and a fraction of a coil located on the other side of said partition and coupled to the other circuit, one end of one of said fractions and the correspondingly located end of the other fraction being connected to said partition, the other ends of said fractions being connected together through a hole in said partition.

5. An energy coupling circuit for magnetically coupling together two circuits separated by a shielding partition, comprising a fraction of a coil located on one side of said partition and coupled to one of said circuits, and a fraction of a coil located on the other side of said partition and coupled to the other circuit, one end of one of said fractions and an end of the other fraction being connected to said partition, the other ends of said fractions being connected together through a hole in said partition.

6. An energy transfer circuit for magnetically coupling together two circuits separated by a shielding wall, comprising a single turn coil hav-

ing parallel elements on opposite sides of and parallel to said wall, one of said parallel elements being coupled to one of said circuits while the other of said parallel elements is coupled to the other of said circuits.

7. Coupling apparatus comprising a pair of wire elements connected together to form a single turn loop, and a shielding surface located between said wire elements.

8. Coupling apparatus comprising a pair of parallel wire elements connected together to form

a single turn loop, and a shielding surface located between and parallel to said wire elements, whereby said loop is substantially devoid of capacity between said wire elements.

9. Coupling apparatus comprising a pair of wire elements connected together to form a single turn loop, and a shielding surface located between said wire elements and connected to said loop at one point.

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