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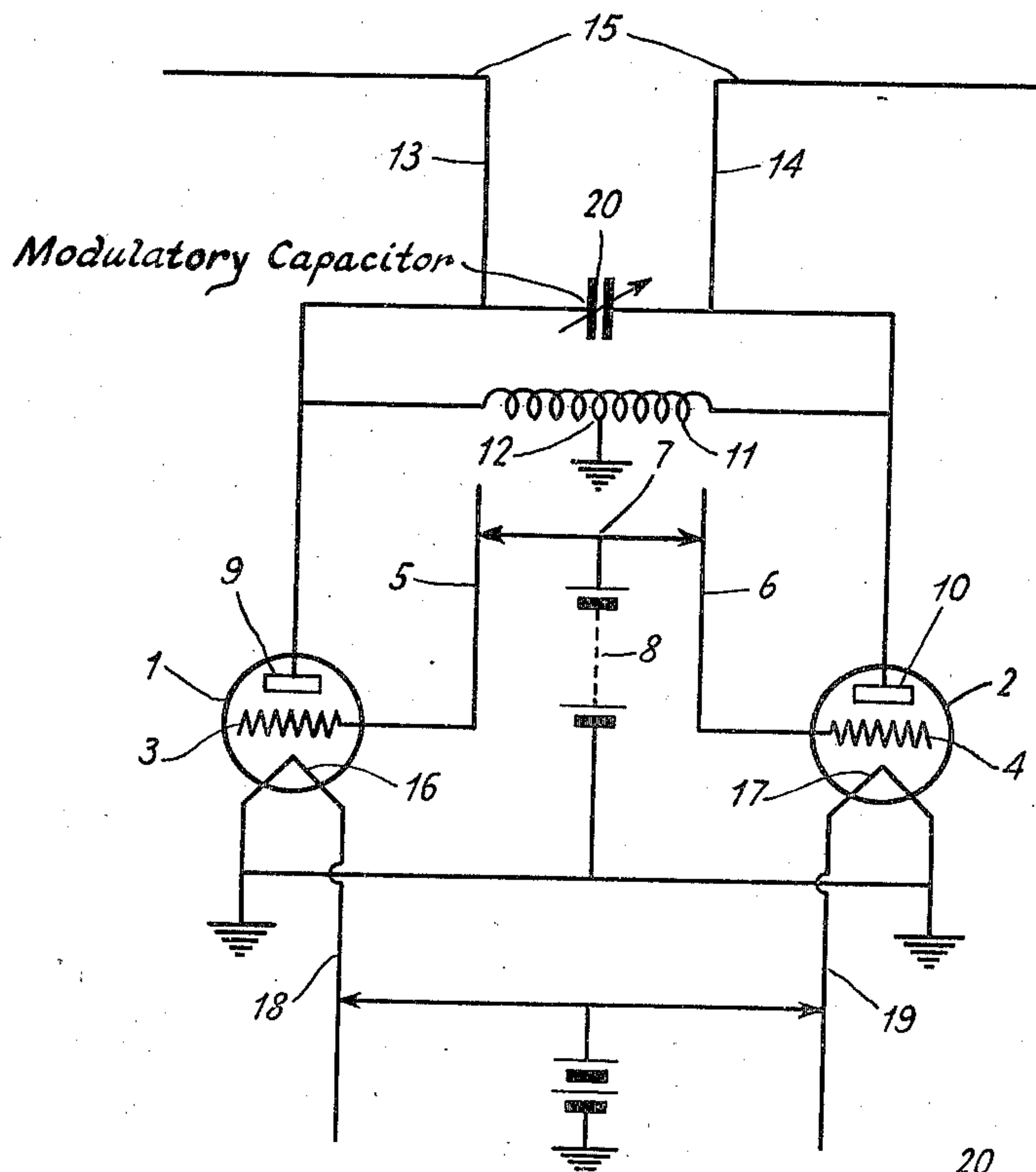
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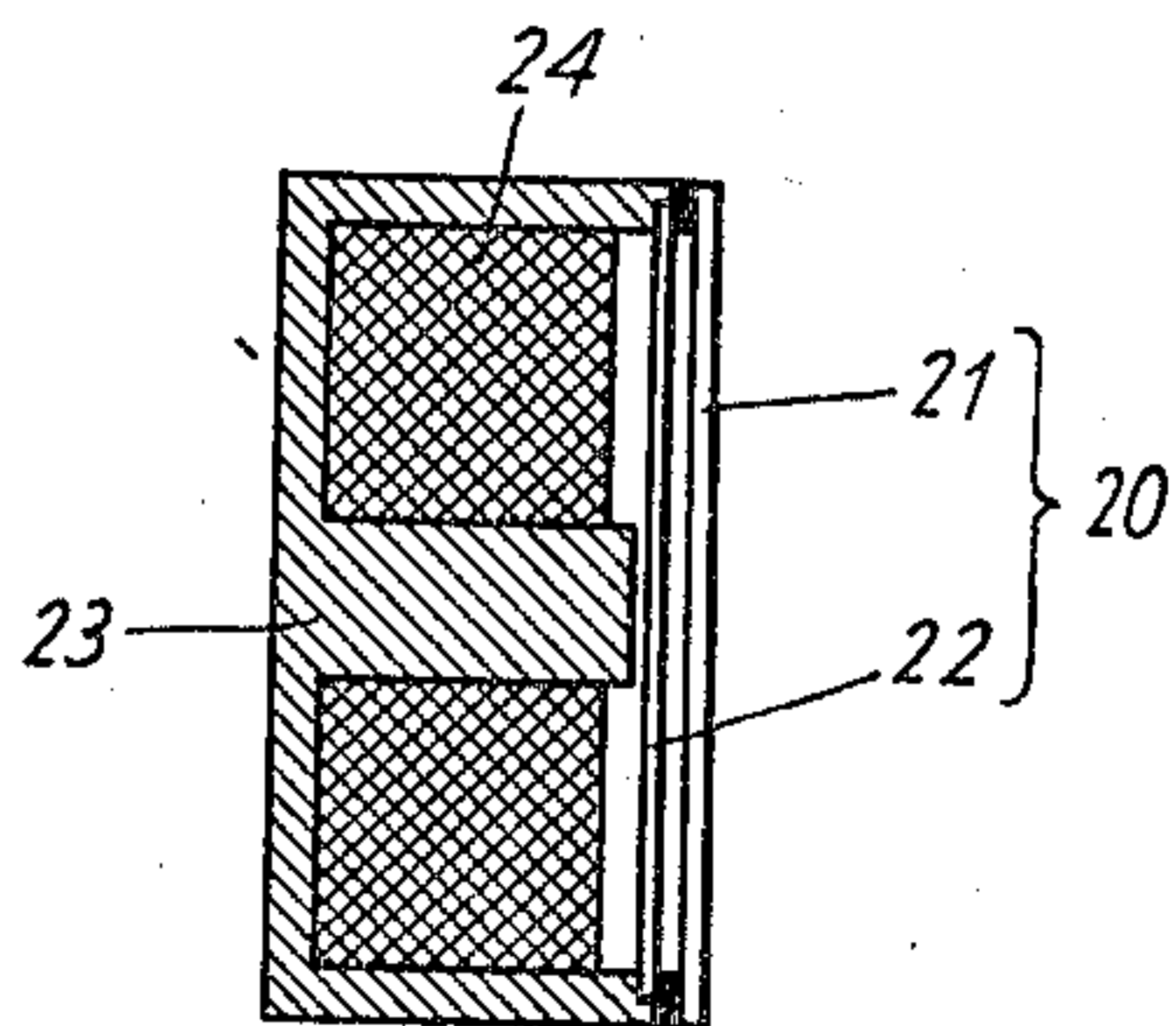
ULTRA HIGH FREQUENCY TRANSMITTER

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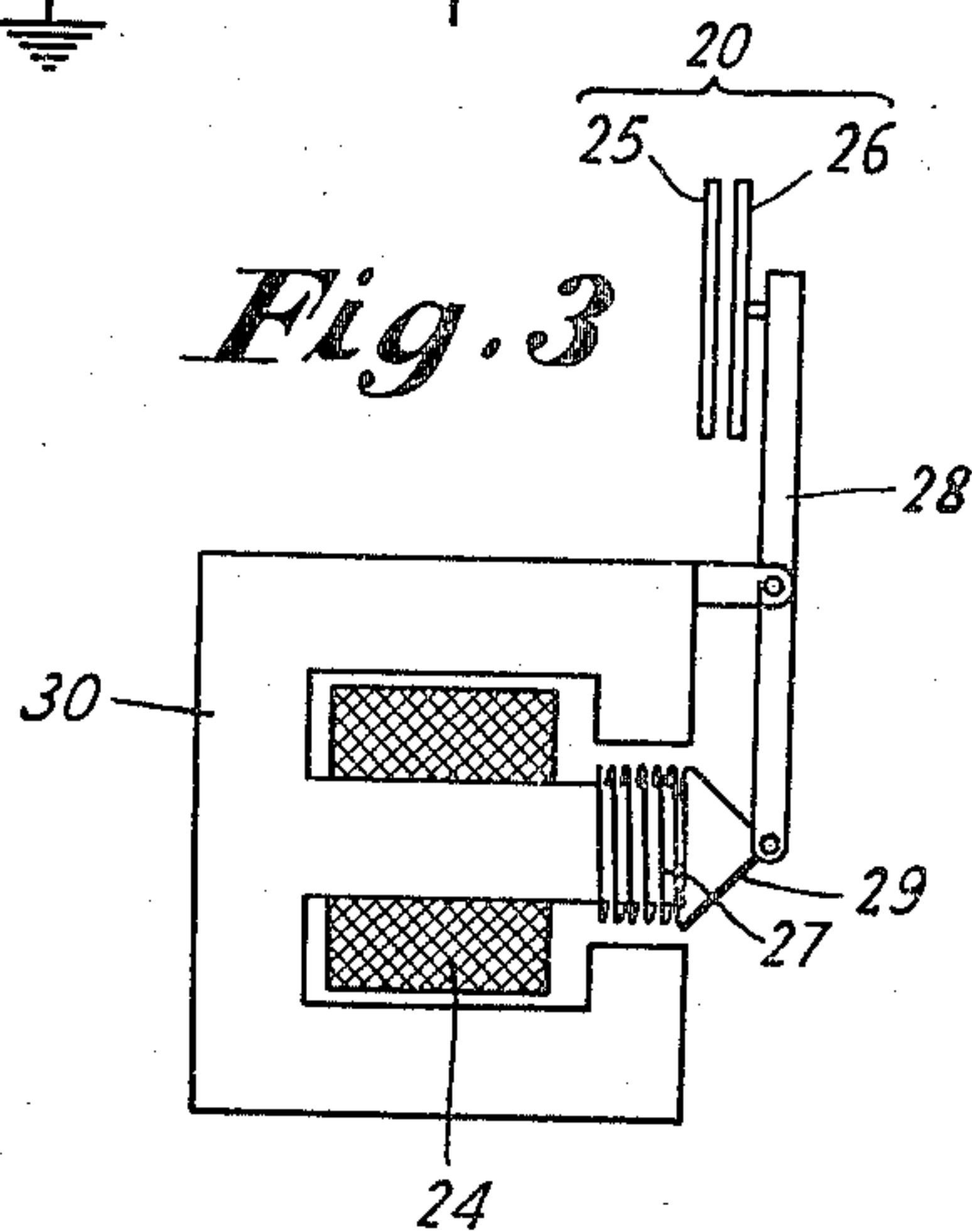
*Fig. 1*



*Fig. 2*



*Fig. 3*



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## UNITED STATES PATENT OFFICE

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## ULTRA HIGH FREQUENCY TRANSMITTER

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5 Claims. (Cl. 250—17)

This invention relates to modulated carrier wave transmitters and more particularly to modulated carrier wave transmitters of the kind comprising oscillators operating upon the so-called Barkhausen-Kurz or Gill-Morell principle, i. e. of the kind comprising a thermionic oscillator whose grid is maintained at a positive potential relative to the cathode and anode thereof so that electrons overshoot the grid, are retarded in the grid-anode space, change direction, return through the grid, change direction again and oscillate back and forth through the grid until finally collected thereby.

Barkhausen-Kurz or Gill-Morell and like oscillators are commonly employed for the generation of very high frequency oscillations, e. g., for very short wave radio transmission. The usual practice is to take the oscillatory energy from the oscillating valve or valves by means of a Lecher wire system or other tuned circuit and thus to transfer the said energy to the radiating dipole or other utilization device. Modulation of the oscillatory energy is usually effected by varying the oscillator anode or grid potential in accordance with the modulating impulses. One defect of the heretofore known arrangements is that variation in anode or grid potential (for modulation purposes) tends to change the frequency generated since, as is well known, the frequency of the oscillations generated by a Barkhausen-Kurz or Gill-Morell oscillator depends upon the periodicity of the "electron swing" about the grid, which in turn depends largely upon the potentials applied.

The object of the present invention is to avoid the above mentioned defect and to provide an improved modulator arrangement for a Barkhausen-Kurz or Gill-Morell type of oscillator wherein the frequency generated shall not be appreciably, if at all, affected by the applied modulating waves.

According to this invention a Lecher wire or other tuned circuit system associated with a Barkhausen-Kurz or Gill-Morell or like type of oscillator is shunted by a variable condenser and means are provided for varying the capacity of this condenser in dependence upon modulating potentials. In this way modulation is effected without substantially affecting the potentials applied to the oscillator electrodes. It will be appreciated that the effect of varying the shunt condenser in capacity in accordance with the modulation will be effectively to lengthen or shorten electrically the tuned circuit or other Lecher wire system.

The invention is illustrated in the accompanying drawing, in which

Figure 1 shows diagrammatically one embodiment;

Fig. 2 shows a detail of construction of one arrangement of a variable capacitor for use in the circuit of Fig. 1, this capacitor being magnetically controlled by modulating potentials; and

Fig. 3 shows a different arrangement whereby the same capacitor of Fig. 1 may be varied by means of a dynamic actuator under control of modulating potentials.

Referring to Fig. 1, I show a Barkhausen-Kurz or Gill-Morell arrangement comprising two triodes 1, 2, having their grids 3, 4, connected to the wires 5, 6, of a Lecher wire system, a nodal point 7 upon this system being connected to a suitable source 8 of positive potential so that the grids receive the necessary positive potential through the tuned Lecher wire grid system. The anodes 9, 10, of the two valves are connected together through a choke 11, the center point 12 of which is connected either to the cathode point or to a point of small negative or positive potential. Each anode is also connected to one wire 13 or 14 of a pair of Lecher wires which constitute a tuned output circuit each wire of the pair being connected to one half of a radiating dipole 15. The two cathodes 16, 17, are each earthed at one end and each is connected at the other end to one wire 18 or 19 of a tuned Lecher wire system whereby the cathode circuit also is tuned. Shunted between the wires of the anode Lecher wire system is a condenser 20 whose capacity is varied in dependence upon modulating potentials and modulation is effected by varying this capacity. I, therefore, prefer to call this condenser 20 a "modulatory capacitor".

Various forms of variable capacity arrangements can be employed in carrying out this invention. For example, in one convenient form illustrated in Fig. 2 the variable condenser 20 of Fig. 1 is constituted by the capacity between two electrode plates 21, 22, one (21) of which is fixed and the other (22) of which acts as a diaphragm with respect to a magnetic system consisting of a permanent magnet 23 having coils 24 wound thereon the poles of the magnet 23 being adjacent the diaphragm plate 22. When modulating potentials (from a source not shown) are applied to the coils 24 the effective magnetic intensity thereof will vary as the magnetism due to the coils aids or opposes the permanent magnetism. As a result the diaphragm-electrode 22 will move relative to the other electrode 21 of the condenser

and thus the capacity between the two electrodes 21, 22, will be varied in dependence upon the modulating potentials. The electrodes 21, 22, are, of course, insulated from one another and the dielectric of the condenser thereby constituted may be air or some suitable solid di-electric as design requirements may dictate. Solid di-electric is indicated by the broken line.

Fig. 3 shows another form of condenser suitable for use as the condenser 20 of Fig. 1. Here one (25) of two electrodes 25, 26, is fixed and the other (26) is mechanically attached, to the moving coil 27 of an electro-dynamic system resembling the electro-dynamic system of a moving coil loud-speaker or telephone; for example, as shown, the moving electrode 26 may be attached through a suitable pivoted driving lever 28 and cone 29 to a cylindrical coil 27 interposed in the annular gap of a permanent or electro-magnet 30, modulating potentials from a source (not shown) being passed through this coil 27. The coil will accordingly vibrate electro-dynamically just as does the moving coil of an electro-dynamic telephone and in this way the capacity of the condenser 25—26 will be varied.

In an actual example of variable condenser (not illustrated) which was experimentally employed in carrying out this invention the said condenser comprised two plates, one of which was the diaphragm of an ordinary electro-dynamic telephone ear piece and the other of which was constituted by a piece of metal foil about 2 cms. in area, the dielectric being constituted by a sheet of insulating material having a specific inductive capacity of about 2. The foil was stuck on the said sheet and the normal (unmodulated) capacity thus obtained was about 7 micro-micro-farads.

I claim:

1. An oscillatory system of the Barkhausen-Kurz type comprising a pair of electron discharge tubes having their output circuits disposed in a push-pull arrangement, a variable capacitor shunted by an inductance connected across the output circuits of the respective tubes, a dipole antenna system having each radiating arm thereof connected to its respective side of the push-pull output circuit arrangement, and means operable under control of modulating energy for varying the effective value of said capacitor.

2. A system in accordance with claim 1 and having a Lecher-wire system interposed between the anodes of said tubes and the arms of said dipole antenna system.

3. The method of modulating the output energy from a Barkhausen-Kurz oscillator of the type having two electron discharge tubes whose anodes are interconnected by a tuned circuit consisting of an inductance in shunt with a variable capacitor, which method comprises the steps of translating modulating energy into mechanical vibrations and subjecting at least one of the electrodes of said capacitor to said vibrations thereby to vary the thickness of the dielectric between the capacitor electrodes and hence to vary the resonant conditions of said tuned circuit.

4. An oscillatory system comprising a pair of triode electron discharge tubes having their output circuits disposed in a push-pull arrangement, means for polarizing the grids of said tubes highly positive with respect to the cathodes, means for causing the plates of said tubes to act as retard electrodes, a capacitor having one of its electrodes constituted by a magnetically controlled diaphragm, said capacitor being shunted by an inductance and connected across the output circuits of the respective tubes, and a dipole antenna system having each radiating arm thereof connected to its respective side of the push-pull arrangement.

5. An oscillatory system comprising a pair of triode electron discharge tubes having their output circuits disposed in a push-pull arrangement, means for polarizing the grids of said tubes highly positive with respect to the cathodes, means for causing the plates of said tubes to act as retard electrodes, a capacitor shunted by an inductance and connected across the output circuits of the respective tubes, a dipole antenna system having each radiating arm thereof connected to its respective side of the push-pull arrangement, and means including an electromagnetic structure and a coil movable in the field thereof and mechanically linked to one of the electrodes of said capacitor for varying the capacitance thereof, thereby to modulate the output energy of said push-pull arrangement.

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