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STATIC FREQUENCY MULTIPLIER AND MODULATOR

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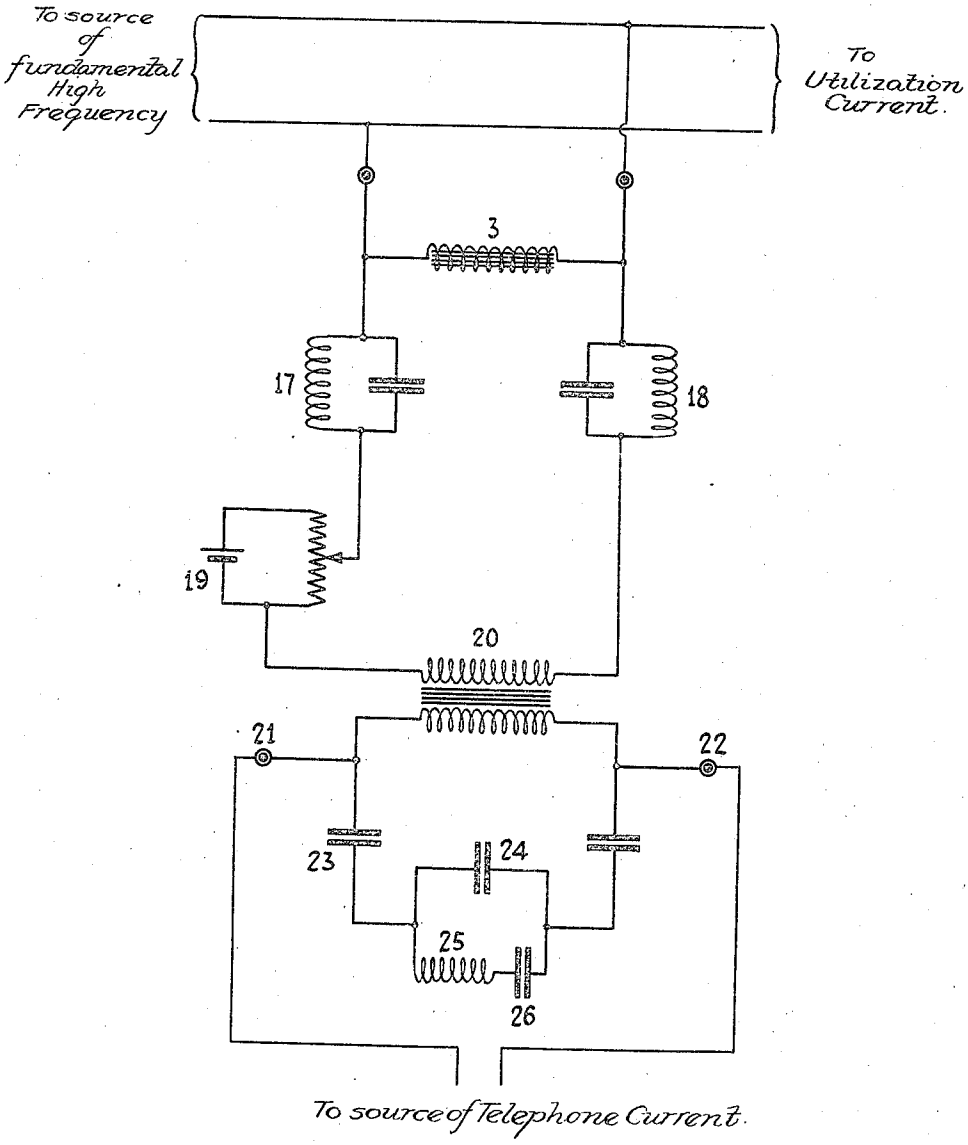

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STATIC FREQUENCY MULTIPLIER AND MODULATOR.

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The present invention relates to the introduction of modulation in static frequency multipliers of the type described in my prior application Serial No. 639,709 for the purpose of producing odd harmonics by saturation with alternating current, without the use of continuous current.

The modulation current is sent directly into the multiplier circuit without the use of any supplementary apparatus; in the case of modulation by a telephone current, a direct voltage is again introduced in the circuit, but this is not done with the object of obtaining the harmonic utilized in the antenna, but rather with the end in view of obtaining an undistorted speech and a more powerful modulation.

The drawing herewith illustrates one embodiment of the idea underlying the invention.

A source of fundamental high frequency supplies current to the iron-core coil 3, in which harmonics of current are produced by the saturation of the core. These harmonics, or multiple frequencies, are then passed on to a utilization circuit, such as an antenna. Detailed arrangements for separating currents of different frequency and for improving the general operation are shown in my prior application referred to above.

Multiplier 3 is fed with modulation current through stoppers 17 and 18 constructed and adapted to impede currents of both the fundamental frequency, and the harmonic frequency so that they will not reach transformer 20, the source of the modulation current. A continuous (direct) voltage is introduced by storage battery 19 in such a manner that the instantaneous value of the modulating current varies practically from a maximum value to zero or a low value. That is, there will flow in the circuits 20, 19, 17, 3, 18 a current consisting of a direct current from source 19 and an alternating modulation current from the secondary of 20; and the direct current is adjusted to be practically equal to the maximum value of the modulation current, so that at the instant when the two are in opposite directions their resultant is nearly zero. Between terminals 21 and 22 of the primary circuit of the transformer 20 are inserted a system of condensers and reactors 23, 24, 25, 26, the purpose of which is to cause compensation of the wattless or reactive current supplied by the secondary of the transformer in the multiplier for a rather wide range of frequencies, there being thus reduced the reactive or apparent power necessary for the feeding of the multiplier.

By means of the arrangement illustrated it is feasible to realize almost complete modulation of the current of harmonic frequency with only 1% of the power furnished by this high frequency in the antenna circuit or the service or working circuit.

The current of harmonic frequency may moreover be rectified by the aid of mercury-vapor rectifiers or any other cathodic rectifier devices, in such a way that it is possible to obtain by means of static multipliers real amplifiers for currents having musical frequencies, in the very same manner as with three-electrode valves.

It goes without saying that amplifier arrangements made up of several stages could be constructed by thus rectifying the high frequency current. Also the principle of reaction could be resorted to for the purpose of increasing the amplification.

According to such principle of cascade-arranged multipliers with cathode rectifiers, a workable plan may be to use one multiplier of 1 kilowatt controlled by a power of 10 watts, which in its turn would control a multiplier of 100 kilowatts. The direct current will be sent into a special winding of the multiplier.

Transformer 20 should preferably be built with an air-gap so as to avoid saturation caused by the flow of the direct current.

Having described my invention, what I claim is:

1. In a modulating system, a core of magnetic material, one winding only for said core, a source of high frequency currents associated with said winding, and a circuit shunting said winding, said circuit comprising a tuning element and a source of modulating current.

2. In a modulating system, a single winding having a core of magnetic material, a source of high frequency current associated therewith, a circuit in shunt with said winding comprising a plurality of tuning elements, a source of continuous voltage and a source of modulating current.

3. In a modulating system, a single winding having a core of magnetic material

adapted to be saturated, a source of high frequency current associated therewith, a circuit in shunt with said winding, said circuit comprising a plurality of tuning elements, a source of direct current and the secondary of a transformer the primary of said transformer having associated therewith a source of modulating current.

4. A system for producing modulated high frequency current comprising a source of moderately high frequency current; a source of low frequency current; a source of direct current; a coil receiving said high frequency current, said low frequency current and said direct current; and a core for said coil adapted to be magnetically saturated by said currents.

5. In a modulating system, a winding provided with a magnetic core, a source of fundamental high frequency current connected across the terminals of said winding, a shunt circuit connected across the terminals of said winding, said shunt circuit having included therein the secondary winding of a transformer and means offering high impedance to high frequency currents, a second circuit serially including the primary winding of said transformer, a source of low frequency modulating current connected in said last mentioned circuit, and means associated with said transformer including inductance and capacity for compensating for the reactive current supplied by the secondary winding of said transformer.

6. In a modulating system, a winding provided with a magnetic core, a source of fundamental high frequency current connected across the terminals of said winding, a shunt circuit connected across the terminals of said winding, said shunt circuit having included therein a source of direct current, the secondary winding of a transformer and means offering high impedance to high frequency currents, a second circuit serially including the primary winding of said transformer, a source of low frequency modulating current connected in said last mentioned circuit, and means associated with said transformer including inductance and capacity for compensating for the reactive current supplied by the secondary winding of said transformer.

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