

**CPC****COOPERATIVE PATENT CLASSIFICATION****H03B**

**GENERATION OF OSCILLATIONS, DIRECTLY OR BY FREQUENCY-CHANGING, BY CIRCUITS EMPLOYING ACTIVE ELEMENTS WHICH OPERATE IN A NON-SWITCHING MANNER ; GENERATION OF NOISE BY SUCH CIRCUITS** ( [measuring, testing G01R](#) ; [generators adapted for electrophonic musical instruments G10H](#) ; [Speech synthesis G10L](#) ; [masers, lasers H01S](#) ; [dynamo-electric machines H02K](#) ; [power inverter circuits H02M](#) ; [by using pulse techniques H03K](#) ; [automatic control of generators H03L](#) ; [starting, synchronisation or stabilisation of generators where the type of generator is irrelevant or unspecified H03L](#) ; [generation of oscillations in plasma H05H](#) )

**Guidance heading:****H03B 1/00****Details****H03B 1/02**

- . Structural details of power oscillators, e.g. for heating { ( [construction of transmitters H04B](#) ; [features of generators for heating by electromagnetic fields H05B 6/00](#) ) }

**H03B 1/04**

- . Reducing undesired oscillations, e.g. harmonics

**H03B 5/00**

**Generation of oscillations using amplifier with regenerative feedback from output to input** ( [H03B 9/00](#) , [H03B 15/00](#) take precedence )

**H03B 5/02**

- . Details

**H03B 5/04**

- .. Modifications of generator to compensate for variations in physical values, e.g. power supply, load, temperature

**H03B 5/06**

- .. Modifications of generator to ensure starting of oscillations

**H03B 5/08**

- . with frequency-determining element comprising lumped inductance and capacitance

**H03B 5/10**

- .. active element in amplifier being vacuum tube ( [H03B 5/14](#) takes precedence )

**H03B 5/12**

- .. active element in amplifier being semiconductor device ( [H03B 5/14](#) takes precedence )

**WARNING**

Subgroups [H03B 5/1203](#) to [H03B 5/1296](#) are incomplete pending reclassification; see also the other subgroups of [H03B 5/12](#)

**H03B 5/1203**

- ... { the amplifier being a single transistor }

**H03B 5/1206**

- ... { using multiple transistors for amplification }

**H03B 5/1209**

- .... { the amplifier having two current paths operating in a differential manner and a current source or degeneration circuit in common to both paths e.g. a long-tailed pair. ( [H03B 5/1215](#) takes precedence ) }

**H03B 5/1212**

- .... { the amplifier comprising a pair of transistors, wherein an output terminal of each being connected to an input terminal of the other, e.g. a cross coupled pair }

H03B 5/1215	.....	{ the current source or degeneration circuit being in common to both transistors of the pair, e.g. a cross-coupled long-tailed pair }
H03B 5/1218	....	{ the generator being of the balanced type }
H03B 5/1221	....	{ the amplifier comprising multiple amplification stages connected in cascade }
H03B 5/1225	....	{ the generator comprising multiple amplifiers connected in parallel }
H03B 5/1228	...	{ the amplifier comprising one or more field effect transistors }
H03B 5/1231	...	{ the amplifier comprising one or more bipolar transistors }
H03B 5/1234	...	{ and comprising means for varying the output amplitude of the generator ( <a href="#">H03B 5/1278</a> takes precedence ) }
H03B 5/1237	...	{ comprising means for varying the frequency of the generator }
H03B 5/124	....	{ the means comprising a voltage dependent capacitance }
H03B 5/1243	.....	{ the means comprising voltage variable capacitance diodes }
H03B 5/1246	.....	{ the means comprising transistors used to provide a variable capacitance }
H03B 5/125	.....	{ the transistors being bipolar transistors }
H03B 5/1253	.....	{ the transistors being field-effect transistors }
H03B 5/1256	....	{ the means comprising a variable inductance }
H03B 5/1259	.....	{ the means comprising a variable active inductor e.g. gyrator circuits }
H03B 5/1262	....	{ the means comprising switched elements }
H03B 5/1265	.....	{ switched capacitors }
H03B 5/1268	.....	{ switched inductors }
H03B 5/1271	....	{ the frequency being controlled by a control current i.e. current controlled oscillators }
H03B 5/1275	....	{ having further means for varying a parameter in dependence on the frequency }
H03B 5/1278	.....	{ the parameter being an amplitude of a signal, e.g. maintaining a constant output amplitude over the frequency range }
H03B 5/1281	.....	{ the parameter being the amount of feedback }
H03B 5/1284	.....	{ the parameter being another frequency, e.g. a harmonic of the oscillating frequency }
H03B 5/1287	.....	{ the parameter being a quality factor, e.g. Q factor of the frequency determining element }
H03B 5/129	.....	{ the parameter being a bias voltage or a power supply }
H03B 5/1293	....	{ having means for achieving a desired tuning characteristic e.g. linearising the frequency characteristic across the tuning voltage range }
H03B 5/1296	...	{ the feedback circuit comprising a transformer }
H03B 5/14	..	frequency-determining element connected via bridge circuit to closed ring around which signal is transmitted
H03B 5/16	...	active element in amplifier being vacuum tube
H03B 5/18	.	with frequency-determining element comprising distributed inductance and capacitance
H03B 5/1805	..	{ the frequency-determining element being a coaxial resonator }
H03B 5/1811	...	{ the active element in the amplifier being a vacuum tube ( <a href="#">see provisionally also H03B 5/1835</a> ) }

- H03B 5/1817 . . { the frequency-determining element being a cavity resonator }
- H03B 5/1823 . . . { the active element in the amplifier being a semiconductor device }
- H03B 5/1829 . . . . { the semiconductor device being a field-effect device }
- H03B 5/1835 . . . { the active element in the amplifier being a vacuum tube }
- H03B 5/1841 . . { the frequency-determining element being a strip line resonator ( [H03B 5/1805](#) , [H03B 5/1817](#) , [H03B 5/1864](#) and [H03B 5/1882](#) take precedence ) }
- H03B 5/1847 . . . { the active element in the amplifier being a semiconductor device }
- H03B 5/1852 . . . . { the semiconductor device being a field-effect device }
- H03B 5/1858 . . . { the active element in the amplifier being a vacuum tube ( see provisionally also [H03B 5/1835](#) ) }
- H03B 5/1864 . . { the frequency-determining element being a dielectric resonator }
- H03B 5/187 . . . { the active element in the amplifier being a semiconductor device }
- H03B 5/1876 . . . . { the semiconductor device being a field-effect device }
- H03B 5/1882 . . { the frequency-determining element being a magnetic-field sensitive resonator, e.g. a Yttrium Iron Garnet or a magnetostatic surface wave resonator }
- H03B 5/1888 . . . { the active element in the amplifier being a semiconductor device }
- H03B 5/1894 . . . . { the semiconductor device being a field-effect device }
- H03B 5/20 . with frequency-determining element comprising resistance and either capacitance or inductance, e.g. phase-shift oscillator
- H03B 5/22 . . active element in amplifier being vacuum tube ( [H03B 5/26](#) takes precedence )
- H03B 5/24 . . active element in amplifier being semiconductor device ( [H03B 5/26](#) takes precedence )
- H03B 5/26 . . frequency-determining element being part of bridge circuit in closed ring around which signal is transmitted ; frequency-determining element being connected via a bridge circuit to such a closed ring, e.g. Wien-Bridge oscillator, parallel-T oscillator
- H03B 5/28 . . . active element in amplifier being vacuum tube
- H03B 5/30 . with frequency-determining element being electromechanical resonator
- H03B 5/32 . . being a piezo-electric resonator ( selection of piezo-electric material [H01L 41/00](#) )
- H03B 5/323 . . . { the resonator having more than two terminals ( [H03B 5/326](#) takes precedence ) }
- H03B 5/326 . . . { the resonator being an acoustic wave device, e.g. SAW or BAW device }
- H03B 5/34 . . . active element in amplifier being vacuum tube ( [H03B 5/38](#) takes precedence )
- H03B 5/36 . . . active element in amplifier being semiconductor device ( { [H03B 5/323](#) , [H03B 5/326](#) } , [H03B 5/38](#) take precedence )
- H03B 5/362 . . . . { the amplifier being a single transistor ( [H03B 5/364](#) to [H03B 5/368](#) take precedence ) }
- H03B 5/364 . . . . { the amplifier comprising field effect transistors ( [H03B 5/366](#) takes precedence ) }
- H03B 5/366 . . . . { and comprising means for varying the frequency by a variable voltage or current }
- H03B 5/368 . . . . . { the means being voltage variable capacitance diodes }
- H03B 5/38 . . frequency-determining element being connected via bridge circuit to closed ring around which signal is transmitted
- H03B 5/40 . . being a magnetostrictive resonator ( [H03B 5/42](#) takes precedence; selection of magneto-strictive material { [H01F 1/00](#) } ; [H01L 41/00](#) )

H03B 5/42 . . frequency-determining element connected via bridge circuit to closed ring around which signal is transmitted

**H03B 7/00** **Generation of oscillations using active element having a negative resistance between two of its electrodes ( [H03B 9/00](#) takes precedence )**

H03B 7/02 . with frequency-determining element comprising lumped inductance and capacitance

H03B 7/04 . . active element being vacuum tube

H03B 7/06 . . active element being semiconductor device

H03B 7/08 . . . being a tunnel diode

H03B 7/10 . . active element being gas-discharge or arc-discharge tube

H03B 7/12 . with frequency-determining element comprising distributed inductance and capacitance

H03B 7/14 . . active element being semiconductor device

H03B 7/143 . . . { and which comprises an element depending on a voltage or a magnetic field, e.g. varactor- YIG }

H03B 7/146 . . . { with several semiconductor devices }

**H03B 9/00** **Generation of oscillations using transit-time effects { ( construction of tube and circuit arrangements not adapted to a particular application [H01J](#) ; construction of the semiconductor devices [H01L](#) ) }**

H03B 9/01 . using discharge tubes

H03B 9/02 . . using a retarding-field tube ( using klystrons [H03B 9/04](#) )

H03B 9/04 . . using a klystron

H03B 9/06 . . . using a reflex klystron

H03B 9/08 . . using a travelling-wave tube

H03B 9/10 . . using a magnetron

H03B 9/12 . using solid state devices, e.g. Gunn-effect devices

H03B 2009/123 . . using Gunn diodes

H03B 2009/126 . . using impact ionization avalanche transit time (IMPATT) diodes

H03B 9/14 . . and elements comprising distributed inductance and capacitance

H03B 9/141 . . . { and comprising a voltage sensitive element, e.g. varactor }

H03B 9/142 . . . { and comprising a magnetic field sensitive element, e.g. YIG }

H03B 9/143 . . . { using more than one solid state device }

H03B 9/145 . . . { the frequency being determined by a cavity resonator, e.g. a hollow waveguide cavity or a coaxial cavity ( [H03B 9/141](#) to [H03B 9/143](#) , [H03B 9/147](#) , [H03B 9/148](#) take precedence ) }

H03B 9/146 . . . . { formed by a disc, e.g. a waveguide cap resonator }

H03B 9/147 . . . { the frequency being determined by a stripline resonator ( [H03B 9/141](#) to [H03B 9/143](#) , [H03B 9/148](#) take precedence ) }

H03B 9/148 . . . { the frequency being determined by a dielectric resonator ( [H03B 9/141](#) to [H03B 9/143](#) take precedence ) }

**H03B 11/00** **Generation of oscillations using a shock-excited tuned circuit ( with feedback**

[5/00](#) )

H03B 11/02 . excited by spark ( [spark gaps therefor H01T 9/00](#) )

H03B 11/04 . excited by interrupter

H03B 11/06 . . by mechanical interrupter

H03B 11/08 . . interrupter being discharge tube

H03B 11/10 . . interrupter being semiconductor device

### **H03B 13/00** Generation of oscillations using deflection of electron beam in a cathode-ray tube

### **H03B 15/00** Generation of oscillations using galvano-magnetic devices, e.g. Hall-effect devices, or using super-conductivity effects ( [galvano-magnetic devices per se H01L 43/00](#) )

H03B 15/003 . { [using superconductivity effects \( devices using superconductivity H01L 39/00 \)](#) }

H03B 15/006 . { [using spin transfer effects or giant magnetoresistance](#) }

### **H03B 17/00** Generation of oscillations using radiation source and detector, e.g. with interposed variable obturator

### **H03B 19/00** Generation of oscillations by non-regenerative frequency multiplication or division of a signal from a separate source ( [transference of modulation from one carrier to another H03D 7/00](#) )

H03B 19/03 . using non-linear inductance

H03B 19/05 . using non-linear capacitance, e.g. varactor diodes

H03B 19/06 . by means of discharge device or semiconductor device with more than two electrodes

H03B 19/08 . . by means of a discharge device

H03B 19/10 . . . using multiplication only

H03B 19/12 . . . using division only

H03B 19/14 . . by means of a semiconductor device

H03B 19/16 . using uncontrolled rectifying devices, e.g. rectifying diodes or Schottky diodes

H03B 19/18 . . and elements comprising distributed inductance and capacitance

H03B 19/20 . . being diodes exhibiting charge storage or enhancement effects

### **H03B 21/00** Generation of oscillations by combining unmodulated signals of different frequencies ( [H03B 19/00 takes precedence; frequency changing circuits in general H03D](#) )

H03B 21/01 . by beating unmodulated signals of different frequencies

H03B 21/02 . . by plural beating, i.e. for frequency synthesis; { [Beating in combination with](#)

multiplication or division of frequency ( digital frequency synthesis using a ROM [G06F 1/02](#) ; digital frequency synthesis in general [H03K](#) ; indirect frequency synthesis using a PLL [H03L 7/16](#) ) }

[H03B 21/025](#) . . . { by repeated mixing in combination with division of frequency only }

[H03B 21/04](#) . . . using several similar stages

**[H03B 23/00](#)** Generation of oscillations periodically swept over a predetermined frequency range ( angle-modulating circuits in general [H03C 3/00](#) )

**[H03B 25/00](#)** Simultaneous generation by a free-running oscillator of oscillations having different frequencies

**[H03B 27/00](#)** Generation of oscillations providing a plurality of outputs of the same frequency but differing in phase, other than merely two anti-phase outputs

**[H03B 28/00](#)** Generation of oscillations by methods not covered by groups [H03B 5/00](#) to [H03B 27/00](#) , including modification of the waveform to produce sinusoidal oscillations ( analogue function generators for performing computing operations [G06G 7/26](#) ; use of transformers for conversion of waveform in ac-ac converters [H02M 5/18](#) )

**[H03B 29/00](#)** Generation of noise currents and voltages { ( gasfilled discharge tubes with solid cathode specially adapted as noise generators [H01J 17/005](#) ) }

#### Guidance heading:

**[H03B 2200/00](#)** Indexing scheme relating to details of oscillators covered by [H03B](#)

[H03B 2200/0002](#) . Types of oscillators

[H03B 2200/0004](#) . . Butler oscillator

[H03B 2200/0006](#) . . Clapp oscillator

[H03B 2200/0008](#) . . Colpitts oscillator

[H03B 2200/001](#) . . Hartley oscillator

[H03B 2200/0012](#) . . Pierce oscillator

[H03B 2200/0014](#) . Structural aspects of oscillators

[H03B 2200/0016](#) . . including a ring, disk or loop shaped resonator

[H03B 2200/0018](#) . . relating to the cutting angle of a crystal, e.g. AT cut quartz

[H03B 2200/002](#) . . making use of ceramic material

[H03B 2200/0022](#) . . characterised by the substrate, e.g. material

[H03B 2200/0024](#) . . including parallel striplines

[H03B 2200/0026](#) . . relating to the pins of integrated circuits

[H03B 2200/0028](#) . . based on a monolithic microwave integrated circuit (MMIC)

[H03B 2200/003](#) . Circuit elements of oscillators

- H03B 2200/0032 . . including a device with a Schottky junction
- H03B 2200/0034 . . including a buffer amplifier
- H03B 2200/0036 . . including an emitter or source coupled transistor pair or a long tail pair
- H03B 2200/0038 . . including a current mirror
- H03B 2200/004 . . including a variable capacitance, e.g. a varicap, a varactor or a variable capacitance of a diode or transistor
- H03B 2200/0042 . . . the capacitance diode being in the feedback path
- H03B 2200/0044 . . including optical elements e.g. optical injection locking
- H03B 2200/0046 . . including measures to switch the gain of an amplifier
- H03B 2200/0048 . . including measures to switch the frequency band, e.g. by harmonic selection
- H03B 2200/005 . . including measures to switch a capacitor
- H03B 2200/0052 . . including measures to switch the feedback circuit
- H03B 2200/0054 . . including measures to switch a filter, e.g. for frequency tuning or for harmonic selection
- H03B 2200/0056 . . including a diode used for switching
- H03B 2200/0058 . . with particular transconductance characteristics, e.g. an operational transconductance amplifier
- H03B 2200/006 . Functional aspects of oscillators
- H03B 2200/0062 . . Bias and operating point
- H03B 2200/0064 . . Pulse width, duty cycle or on/off ratio
- H03B 2200/0066 . . Amplitude or AM detection
- H03B 2200/0068 . . Frequency or FM detection
- H03B 2200/007 . . Generation of oscillations based on harmonic frequencies, e.g. overtone oscillators
- H03B 2200/0072 . . Frequency hopping and enabling of rapid frequency changes
- H03B 2200/0074 . . Locking of an oscillator by injecting an input signal directly into the oscillator
- H03B 2200/0076 . . Power combination of several oscillators oscillating at the same frequency
- H03B 2200/0078 . . generating or using signals in quadrature
- H03B 2200/008 . . making use of a reference frequency
- H03B 2200/0082 . . Lowering the supply voltage and saving power
- H03B 2200/0084 . . dedicated to Terahertz frequencies
- H03B 2200/0086 . . relating to the Q factor or damping of the resonant circuit
- H03B 2200/0088 . . Reduction of noise
- H03B 2200/009 . . . Reduction of phase noise
- H03B 2200/0092 . . Measures to linearise or reduce distortion of oscillator characteristics
- H03B 2200/0094 . . Measures to ensure starting of oscillations
- H03B 2200/0096 . . Measures to ensure stopping of oscillations
- H03B 2200/0098 . . having a balanced output signal

#### Guidance heading:

#### **H03B 2201/00 Aspects of oscillators relating to varying the frequency of the oscillations**

- H03B 2201/01 . Varying the frequency of the oscillations by manual means



- H03B 2201/011 . . the means being an element with a variable capacitance
- H03B 2201/012 . . the means being an element with a variable inductance
- H03B 2201/014 . . the means being associated with an element comprising distributed inductances and capacitances
- H03B 2201/015 . . . the element being a cavity
- H03B 2201/017 . . . the element being a dielectric resonator
- H03B 2201/018 . . the means being a manual switch
  
- H03B 2201/02 . Varying the frequency of the oscillations by electronic means
- H03B 2201/0208 . . the means being an element with a variable capacitance, e.g. capacitance diode
- H03B 2201/0216 . . the means being an element with a variable inductance
- H03B 2201/0225 . . the means being associated with an element comprising distributed inductances and capacitances
- H03B 2201/0233 . . . the element being a cavity
- H03B 2201/0241 . . . the element being a magnetically variable element, e.g. an Yttrium Iron Garnet
- H03B 2201/025 . . the means being an electronic switch for switching in or out oscillator elements
- H03B 2201/0258 . . . the means comprising a diode
- H03B 2201/0266 . . . the means comprising a transistor
- H03B 2201/0275 . . the means delivering several selected voltages or currents
- H03B 2201/0283 . . . the means functioning digitally
- H03B 2201/0291 . . . . and being controlled by a processing device, e.g. a microprocessor
  
- H03B 2201/03 . Varying beside the frequency also another parameter of the oscillator in dependence on the frequency
- H03B 2201/031 . . the parameter being the amplitude of a signal, e.g. maintaining a constant output amplitude over the frequency range
- H03B 2201/033 . . the parameter being the amount of feedback
- H03B 2201/035 . . the parameter being another frequency, e.g. a harmonic of the oscillating frequency
- H03B 2201/036 . . the parameter being the quality factor of a resonator
- H03B 2201/038 . . the parameter being a bias voltage or a power supply

### **H03B 2202/00 Aspects of oscillators relating to reduction of undesired oscillations**

- H03B 2202/01 . Reduction of undesired oscillations originated from distortion in one of the circuit elements of the oscillator
- H03B 2202/012 . . the circuit element being the active device
- H03B 2202/015 . . the circuit element being a limiter
- H03B 2202/017 . . the circuit element being a frequency determining element
  
- H03B 2202/02 . Reduction of undesired oscillations originated from natural noise of the circuit elements of the oscillator
- H03B 2202/022 . . the noise being essentially white noise, i.e. frequency independent noise
- H03B 2202/025 . . the noise being coloured noise, i.e. frequency dependent noise
- H03B 2202/027 . . . the noise being essentially proportional to the inverse of the frequency, i.e. the so-called 1/f noise



- H03B 2202/03 . Reduction of undesired oscillations originated from internal parasitic couplings, i.e. parasitic couplings within the oscillator itself
- H03B 2202/04 . Reduction of undesired oscillations originated from outside noise or interferences, e.g. from parasitic couplings with circuit elements outside the oscillator
- H03B 2202/042 . . the circuit element belonging to the power supply
- H03B 2202/044 . . the circuit element belonging to transmitter circuitry
- H03B 2202/046 . . the circuit element belonging to receiver circuitry
- H03B 2202/048 . . the circuit element being a frequency divider
- H03B 2202/05 . Reduction of undesired oscillations through filtering or through special resonator characteristics
- H03B 2202/06 . Reduction of undesired oscillations through modification of a bias voltage, e.g. selecting the operation point of an active device
- H03B 2202/07 . Reduction of undesired oscillations through a cancelling of the undesired oscillation
- H03B 2202/073 . . by modifying the internal feedback of the oscillator
- H03B 2202/076 . . by using a feedback loop external to the oscillator, e.g. the so-called noise degeneration
- H03B 2202/08 . Reduction of undesired oscillations originated from the oscillator in circuit elements external to the oscillator by means associated with the oscillator
- H03B 2202/082 . . by avoiding coupling between these circuit elements
- H03B 2202/084 . . . through shielding
- H03B 2202/086 . . . through a frequency dependent coupling, e.g. which attenuates a certain frequency range
- H03B 2202/088 . . by compensating through additional couplings with these circuit elements