

**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](#))

**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<br>( <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 \[H03B 5/00\]\(#\)](#))**

- [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  |
| <b>H03B 13/00</b> |     | <b>Generation of oscillations using deflection of electron beam in a cathode-ray tube</b>   |
| <b>H03B 15/00</b> |     | <b>Generation of oscillations using galvano-magnetic devices, e.g. Hall-effect devices, or using super-conductivity effects (galvano-magnetic devices per se <a href="#">H01L 43/00</a>)</b>  |
| H03B 15/003       | .   | {using superconductivity effects (devices using superconductivity <a href="#">H01L 39/00</a> )}   |
| H03B 15/006       | .   | {using spin transfer effects or giant magnetoresistance}  |
| <b>H03B 17/00</b> |     | <b>Generation of oscillations using radiation source and detector, e.g. with interposed variable obturator</b>  |
| <b>H03B 19/00</b> |     | <b>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 <a href="#">H03D 7/00</a>)</b>  |
| 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   |
| <b>H03B 21/00</b> |     | <b>Generation of oscillations by combining unmodulated signals of different frequencies (<a href="#">H03B 19/00</a> takes precedence; frequency changing circuits in general <a href="#">H03D</a>)</b>  |
| 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 <a href="#">G06F 1/02</a> ; digital frequency synthesis in general <a href="#">H03K</a> ; indirect frequency synthesis using a PLL <a href="#">H03L 7/16</a> )} |
| H03B 21/025       | ... | {by repeated mixing in combination with division of frequency only}   |
| H03B 21/04        | ..  | using several similar stages  |
| <b>H03B 23/00</b> |     | <b>Generation of oscillations periodically swept over a predetermined frequency range (angle-modulating circuits in general <a href="#">H03C 3/00</a>)</b>  |
| <b>H03B 25/00</b> |     | <b>Simultaneous generation by a free-running oscillator of oscillations having different frequencies</b>  |

|                                |  |
|--------------------------------|--|
| <b>H03B 27/00</b>              | <b>Generation of oscillations providing a plurality of outputs of the same frequency but differing in phase, other than merely two anti-phase outputs</b>  |
| <b>H03B 28/00</b>              | <b>Generation of oscillations by methods not covered by groups <a href="#">H03B 5/00</a> to <a href="#">H03B 27/00</a> , including modification of the waveform to produce sinusoidal oscillations (analogue function generators for performing computing operations <a href="#">G06G 7/26</a> ; use of transformers for conversion of waveform in ac-ac converters <a href="#">H02M 5/18</a>)</b> |
| <b>H03B 29/00</b>              | <b>Generation of noise currents and voltages {(gasfilled discharge tubes with solid cathode specially adapted as noise generators <a href="#">H01J 17/005</a>)}</b>  |
| <b>H03B 2200/00</b>            | <b>Indexing scheme relating to details of oscillators covered by <a href="#">H03B</a></b>  |
| <a href="#">H03B 2200/0002</a> | . Types of oscillators   |
| <a href="#">H03B 2200/0004</a> | . . Butler oscillator  |
| <a href="#">H03B 2200/0006</a> | . . Clapp oscillator   |
| <a href="#">H03B 2200/0008</a> | . . Colpitts oscillator  |
| <a href="#">H03B 2200/001</a>  | . . Hartley oscillator   |
| <a href="#">H03B 2200/0012</a> | . . Pierce oscillator  |
| <a href="#">H03B 2200/0014</a> | . Structural aspects of oscillators  |
| <a href="#">H03B 2200/0016</a> | . . including a ring, disk or loop shaped resonator  |
| <a href="#">H03B 2200/0018</a> | . . relating to the cutting angle of a crystal, e.g. AT cut quartz   |
| <a href="#">H03B 2200/002</a>  | . . making use of ceramic material   |
| <a href="#">H03B 2200/0022</a> | . . characterised by the substrate, e.g. material  |
| <a href="#">H03B 2200/0024</a> | . . including parallel striplines  |
| <a href="#">H03B 2200/0026</a> | . . relating to the pins of integrated circuits  |
| <a href="#">H03B 2200/0028</a> | . . based on a monolithic microwave integrated circuit (MMIC)  |
| <a href="#">H03B 2200/003</a>  | . Circuit elements of oscillators  |
| <a href="#">H03B 2200/0032</a> | . . including a device with a Schottky junction  |
| <a href="#">H03B 2200/0034</a> | . . including a buffer amplifier   |
| <a href="#">H03B 2200/0036</a> | . . including an emitter or source coupled transistor pair or a long tail pair   |
| <a href="#">H03B 2200/0038</a> | . . including a current mirror   |
| <a href="#">H03B 2200/004</a>  | . . including a variable capacitance, e.g. a varicap, a varactor or a variable capacitance of a diode or transistor  |
| <a href="#">H03B 2200/0042</a> | . . . the capacitance diode being in the feedback path   |
| <a href="#">H03B 2200/0044</a> | . . including optical elements e.g. optical injection locking  |
| <a href="#">H03B 2200/0046</a> | . . including measures to switch the gain of an amplifier  |
| <a href="#">H03B 2200/0048</a> | . . including measures to switch the frequency band, e.g. by harmonic selection  |
| <a href="#">H03B 2200/005</a>  | . . including measures to switch a capacitor   |
| <a href="#">H03B 2200/0052</a> | . . including measures to switch the feedback circuit  |
| <a href="#">H03B 2200/0054</a> | . . including measures to switch a filter, e.g. for frequency tuning or for harmonic selection   |
| <a href="#">H03B 2200/0056</a> | . . 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

### **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