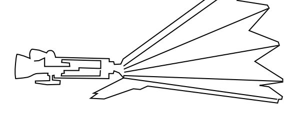
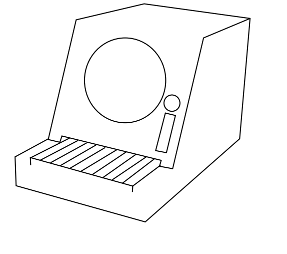


SPEAKING MACHINE
Wolfgang Kempelen
Pressburg 1791

The apparatus consists of a small wooden box to which a bellows – the "lungs" – is attached. On the opposite side is a rubber horn, the "mouth." If the bellows is worked, air enters the box, the "windchest." This air is fed through various flaps and valves, including the "nose." The right hand works the levers and valves in the windchest, the left hand manipulates the flexible horn, which finally produces the "voice."

production: Jakob Scheid, Vienna 2001/02
material: Perspex, wood fiberboard, silicone, nylon, razor-blade, brass, metal needle, rubberized cotton, metal spring
Lender: Brigitte Felderer, Ernst Strouhal, Vienna University of Applied Arts

#01

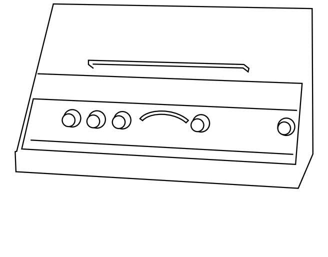


RHYTHMICON
Leon Theremin
New York 1931

Each key controls a lamp whose light triggers a repeated tone by means of mirrors, two rotating wheels (one for pitch and one for rhythm) plus a photocell. Pitches and rhythms follow the same arithmetic progression as the harmonic series. When depressed, each of fifteen keys sounds its own specific rhythm, from one to fifteen equal divisions of a beat, on a pitch that corresponds to the one to fifteen partials in the harmonic series. The speed can be regulated independently of rhythm.

production: Leon Theremin, Moscow 1963
material: Wood, keyboard, lamps, mirrors, two metal wheels, photocell, tube amplifier
Lender: Andrej Smirnov, Theremin Center Moscow

#02

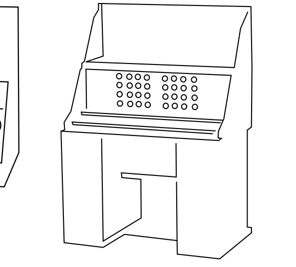


TRAUTONIUM
Friedrich Trautwein
Berlin 1930

Pressing a wire down over a metal rail (bandmanual) regulates the current by adjusting the resistance, which, in combination with a gas discharge tube (thyratron) and a resistor, generates a saw-tooth vibration rich in harmonics. The pressure also controls the volume. Various filters can be used to create different timbres. Wind instrument sounds are obtained using a resonance circuit. The device is not fitted with an amplifier and was therefore connected to a radio. Controls are used to adjust the pitch range.

production: Telefunken AG, Berlin 1933
material: Wood, bandmanual, Thyratron switching with resonance circuits
Lender: Vienna Museum of Technology

#03

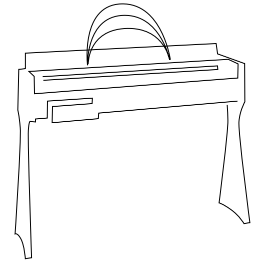


MIXTURE TRAUTONIUM
Oskar Sala
Berlin, from 1950

As with the trautonium, the instrument is played using the bandmanuals. A high-frequency master oscillator is used to produce subharmonics by means of frequency dividers. These subharmonics are combined to create a mixture (the term used for a specific type of organ stop) by means of a selection switch. This generates an idiosyncratic synthetic sound that is completely unlike that of any other known electronic instrument.

reproduction: Doepfer Musikelektronik GmbH, Munich/ Hauk Museumstechnik, Hassfurt 1999
material: Wood, two bandmanuals, analogue VCO, analogue filters, four digital frequency dividers per manual
Lender: Vienna Museum of Technology

#04

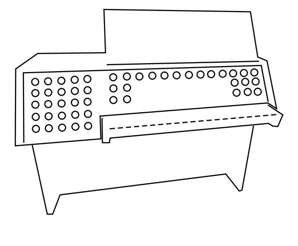


ONDES MARTENOT
Maurice Martenot
Paris 1928

The ondes Martenot33 is based on the overlaying of two high-frequency oscillations and making the difference audible by means of an amplifier. The drawer operated with the left hand contains a controller to regulate the volume as well as buttons to control timbre and to transpose the pitch. The instrument can be played on the keyboard, while a draw-string allows glissandi. The instrument has a range of seven octaves. A special feature is the design of the loudspeakers, one being fitted with strings and one with metal platelets for resonance.

production: Société Ondes Musicales Martenot, Paris 1960
material: Wood, keyboard, draw-string with ring, tube generators, tube amplifiers, three loudspeakers
Lender: Jean-Louis Martenot, Paris

#05

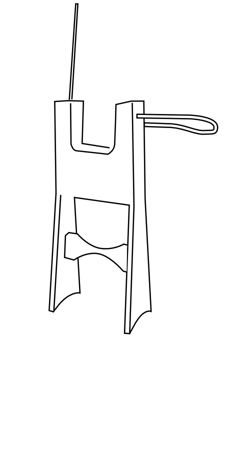


SUBHARCHORD II
Ernst Schreiber
Berlin 1959-1966

The keyboard, designed to react to pressure in order to regulate volume, has a pitch range of three octaves and controls a main generator. The latter, by dividing the frequencies in a ratio of 2:1, generates seven octaves for each key (1' to 64'), hence a total of ten octaves per keyboard. The subharmonic mixtures are produced by four secondary generators whose frequencies are generated by dividing the frequency of the main generator (1/2 to 1/29). Mel and formant filters as well as ring and choir modulators in interaction with the mixtures allow the creation of a wide variety of timbres.

production: RFZ, East Berlin 1968
material: Metal, plastic, keyboard, control generator, vibrato and tremolo generator, binary frequency divider, subharmonic frequency divider, mel filter, noise generator, sinus generator, ring modulator, semiconductor technology
Lender: Jurai Duris, Bratislava

#06

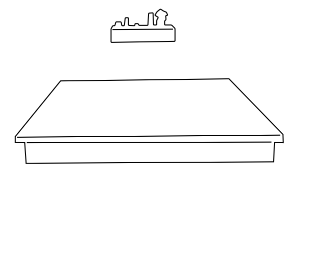


THEREMIN
Leon Theremin
Petrograd ca. 1919

The instrument is based on the principle of induction and the natural capacitance of the human body. Sound is generated by two high-frequency oscillators – one with a fixed frequency, the other variable – and the difference between them. The position of the right hand in respect to the right antenna alters the amount of the capacitance of the variable oscillator and thus determines pitch. The position of the left hand to the left antenna controls volume via changes in voltage.

production: Leon Theremin Moscow 1961
material: Wood, metal, tube oscillators
Lender: Andrej Smirnov, Theremin Center Moscow

#07

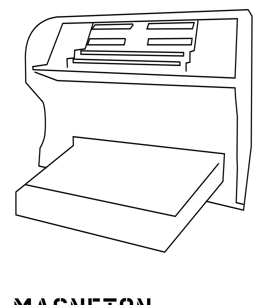


TERPSITONE
Leon Theremin
New York 1930

The terpsitone is a variant of the theremin, and has a metal plate beneath a dance platform that acts as an antenna, thus allowing the vertical movement of the entire body to regulate changes in pitch. A second antenna behind the dancer is used to control volume through horizontal movement. A special mechanism limits the instrument to semitones only.

production: Leon Theremin Moscow 1978
material: Wood, metal, tube oscillators
Lender: Andrej Smirnov, Theremin Center Moscow

#08

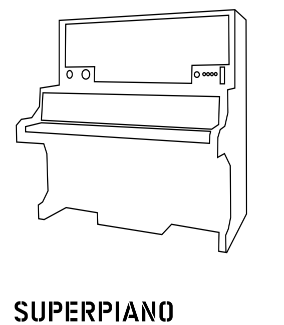


MAGNETON
Wilhelm Lenk / Rudolf Stelzhammer
Vienna 1930

Twelve sets of steel cogwheels rotate in front of recording magnets with speeds at a ratio of 1:1.059 (corresponding to the frequency ratio between adjoining semitones). One set consists of fourteen cogwheels, but the keyboard covers a range of four octaves (the pitch range from 16' to 1' being eight octaves), and thus it is obvious that the remaining cogwheels, thanks to the different shape of their cogs, serve the determination of the timbre. The periodic changes in the magnetic field in the coils generate a tone-frequency alternating current that can be processed using filters or mixed with other tone frequencies. It was this latter method that was used by Laurens Hammond four years after Stelzhammer in the USA.

material: Wood, keyboard, toothed steel discs, recording magnets, tube amplifier
Lender: Vienna Museum of Technology

#09

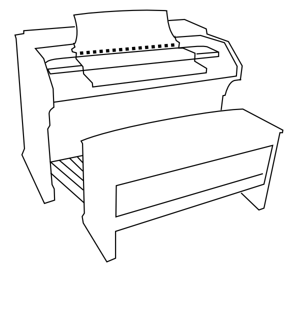


SUPERPIANO
Emerich Spielmann
Vienna 1929

Each of the twelve black celluloid disks has a pattern of slits or holes cut into it in concentric circles, representing seven octaves of a note, e.g. all Cs. Since the instrument is fitted with twenty-four disks, two rows of twelve, each encoded with different wave patterns, it is possible to produce harsher as well as softer tones. The graphic representation of the waveform is read by small lamps and selenium cells, and the signal is amplified. The brightness of the light sources is regulated by variable resistors, one for each key, with the effect that volume is controlled by the degree of pressure applied to the key.

production: Emerich Spielmann, Vienna 1929
Lender: Vienna Museum of Technology
Superpiano
material: Wood, keyboard, celluloid disks, selenium cells, tube amplifier
Lender: Vienna Museum of Technology

#10

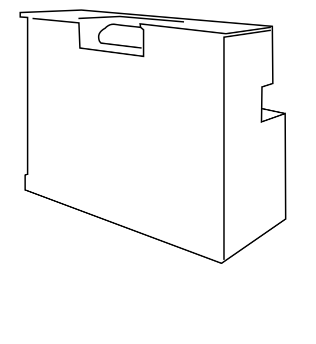


HAMMONDORGAN
Laurens Hammond
Chicago 1935

The cogwheel generator contains 91 tone wheels with a varying number of cogs driven by a synchronous motor, the speed of which depends on the network frequency. The speeds needed to generate the 12 semitones of each octave are obtained by means of a cogwheel drive with different ratios. Drawbars are used to adjust the intensity of the partials in order to configure the sound. The chorus effect is generated by a second tone generator slightly out of tune. The rigid mechanical settings of the frequency generation mean that the organ itself cannot become out of tune.

Model: Hammond E, 1938
material: Wood, keyboard, pedals, synchronous motor, serrated metal tone wheels, permanent magnet, cogwheel drive, tube amplifier
Lender: Eboardmuseum, Klagenfurt

#11

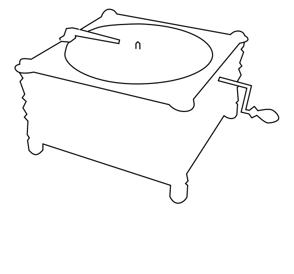


WELTE-MIGNON PUSH-UP PLAYER
Welte & Söhne,
Freiburg/Br. 1904

Push-up play music rolls in the same way as a complete mechanical piano, but using an existing instrument. The roll is "scanned" using air sucked through a "tracker bar", the perforations in the roll corresponding to the positions of the keys on the piano, while the dynamics of the notes are recorded in the margins of the roll. The keys are depressed by levers activated by bellows that are evacuated and filled with air in accordance with the position of the hole.

production: Welte & Söhne, Freiburg/Br. 1910
material: Wood, rolls with perforated paper tape, controlled by lead wires, leather valves, rubber cloth bellows, electric air-pump
Lender: Vienna Museum of Technology

#12

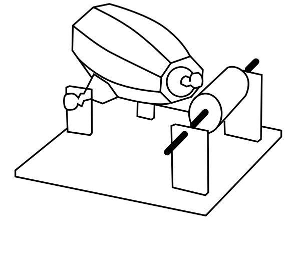


ARISTON
Paul Ehrlich,
Leipzig 1882

The wind needed is generated by a crank mechanism driving two bellows alternately, and kept at a constant pressure by a reservoir. At the same time, the crank mechanism turns the disk using a worm gear, with a bracket pressing the disk downwards onto 24 levers. As the board turns, the levers come underneath the perforations and spring upwards into the hole. This opens the corresponding valve and allows the air to flow through the free reed (harmonica sound) behind the valve. One song lasts one turn of the board, in other words about 45 seconds.

Made by Leipziger Musikwerke, previously under the name Paul Ehrlich, Leipzig 1896
material: Wood, metal, two bellows and a reservoir, crank mechanism with worm gear, press board perforated discs
Lender: Vienna Museum of Technology

#13

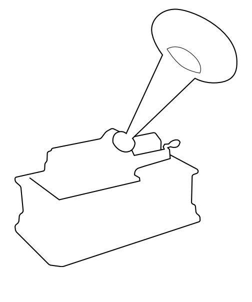


PHONAUTOGRAPH
Édouard-Léon Scott de Martinville,
1855 - 1857

The paper strip is the first documented recording of the vibrations of human speech. It was recorded by Édouard-Léon Scott de Martinville using what he called the "Phonautograph" and was attached to his patent in 1857. To make the recording, a bristle mounted at the end of a megaphone engraved the vibrations into a blackened piece of paper stretched over a drum.

material: Soot-blackened paper
Lender: INPI (Institut National de la Propriete Industrielle), Paris

#14

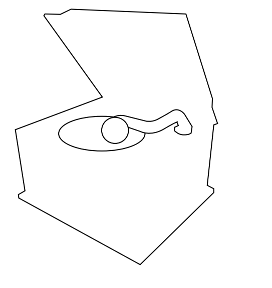


EDISON HOME PHONOGRAPH
Thomas Alva Edison,
Menlo Park, USA 1877

The phonograph is fitted with a spring motor that must be wound up with a crank handle before being played. A switch is used to start the drive for the cylinder drum and the spindle guide. A sapphire needle reads the grooves in the cylinder and transmits the sound waves by means of a lever to a membrane in the reproducer. From the reproducer, the vibrations are transmitted directly to the horn, where they are amplified. Playing time is two or four minutes depending on the type of cylinder.

production: National American Phonograph Co., Orange (USA) 1908
material: Oak casing, black enamel cast elements, moving parts nickelplated, spring drive with hand crank, spindle guide and cylinder, trumpet-shaped horn
Lender: Christian Wittmann, Wolfgraben

#15

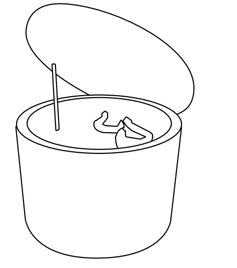


GRAMMOPHONE
Emile Berliner
Washington 1887

The gramophone is equipped with a springdriven motor that is wound up with a crank. A lever is used to start the drive that operates the turntable. The shellac disk is "read" by a steel needle that transmits the lateral vibrations of the groove in the disk to a membrane in the pickup via a small lever. The tonearm then transmits the vibrations to the horn, where they are amplified. The groove on the disk runs in a spiral from the outside to the center and allows a recording of around three minutes.

HMV („His Master's Voice") Grammophone , Model 104
The Gramophone Company, London ca. 1930
material: Oak-veneer board, spring-drive with crank winder, swiveling tonearm with pickup, automatic drive switch, horn in the lower casing
Lender: Christian Wittmann, Wolfgraben

#16

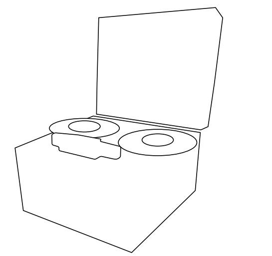


ULTRAPHON
Heinrich Küchenmeister
Berlin 1925

This is a record player with a spring-driven motor that operates according to the gramophone principle. It is fitted with two pickups and two horns at right-angles to each other. At 78 rpm, the second pickup has a delay of 1/15 second as against the first, the result being a sort of spatial sound effect, later referred to as "pseudo-stereo." There were also plans to use the method for the radio using delayed switching.

production: Deutsche Ultraphon Gesellschaft, Berlin 1927
material: Wood, two gramophone pickups, spring-driven motor
Lender: Vienna Museum of Technology

#17

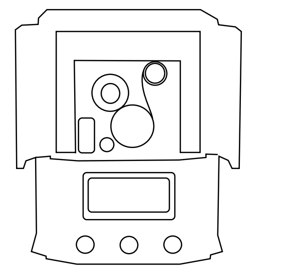


MAGNETOPHON
Fritz Pfleumer
Dresden 1928

A recorder-converter (recording head) converts audio-frequency electrical signals into magnetic fields that cause a permanent magnetization of the mag-netophon tape as it passes the head at a constant speed. When played back, these magnetic fields induce voltages in the playback converter (playback head) and are made audible by means of amplification in a loudspeaker. The constant mechanical tension of the tape is achieved by a "sound motor" for transporting the tape at constant speed dur-ing recording and playback, and two fast-wind motors for fast-forward and rewind. The 6.5 mm wide and 1,000 m long tape can, at a speed of 76 cm per sec., record around 21 minutes of sound.

Magnetophon AEG K4
AEG, Berlin 1938
Wood (foil laminated), magnetophon tape, three magnetic heads, three motors with special deceleration and stopping systems, tube amplifier
Lender: German Museum of Technology Berlin

#18

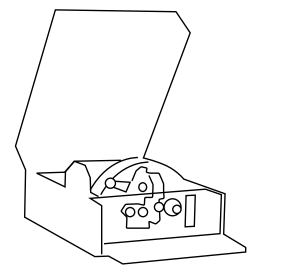


TALKING PAPER
B.P. Skvortsov
Moscow 1931

A wide paper tape containing eight variable-area tracks (as used for film sound) is highlighted by a beam of light of constant intensity. As the recorded tape moves, the reflection of the beam of light varies with the changes of the sound waves. The bundle of light is then reflected by a concave mirror to a light-sensitive cell and converted into electronic oscillations. The device plays all eight tracks one after the other and then stops. In order to restart it, the playback unit must be returned to the starting position. Each strip plays for 50 minutes and can be played back around 3600 times.

production: Kolomna Gramophone Factory, USSR 1940/41
material: Wood, rolls of paper tape, electric motor, photocell, lamp, concave mirror, radio receiver
Lender: A. S. Popov Central Museum of Communications, St. Petersburg

#19

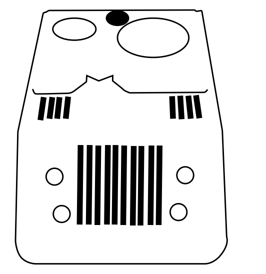


PORTABLE SHORINOPHONE
Alexander F. Shorin
Leningrad 1940

This portable device records sound on a 10 or 20 meter long strip (12 mm) of a (35 mm) cinema film in a cassette. An electrically driven hard ruby or corundum stylus cuts grooves into discarded cinema film used for reasons of economy. The film is driven by a stabilized electric motor, and the sound track is cut in a spiral. The pattern in the groove corresponds to the original sound waves. The 10 or 20 minute recordings were played back by replacing the stylus in the shorinophone with a ruby.

material: Wood, cassette with filmstrips (12 mm), radio valve receiver, electric motor, tonearm with ruby needle
Lender: A. S. Popov Central Museum of Communications, St. Petersburg
Leningrad 1941

#20

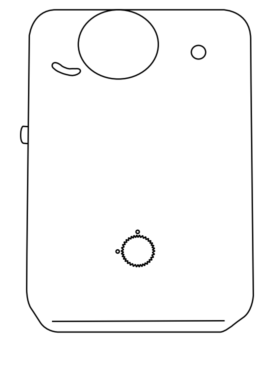


WEBSTER WIRE RECORDER
Paul Ehrlich,
Leipzig 1882

This means of conserving sound is based on thetransverse-magnetization of a steel wire drawn across a recording head. This steel wire system was used as early as around 1900 by the Danish inventor Valdemar Poulsen, whose device was originally intended as a dictation machine. The Webster wire recorder was the first affordable recording device, and with a wire 2,200 meters long and a speed of 60.96 cm (24 inches) per second, could store up to one hour of sound.

production: Webster Chicago Corporation, Chicago 1948
Model: M80
material: Wooden box with leather finish, metal, external microphone, wire coils, built-in loudspeaker, tube amplifier
Lender: Wolfgang Ernst, Berlin

#21

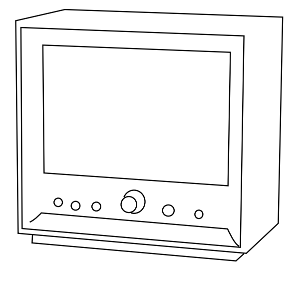


MINIFON
Protona GmbH
Hamburg 1951–1957

The Minifon is a small battery-powered wire tape recorder with a number of accessories (various hand-held microphones, attachable microphone, earphones, spools, batteries etc.). The hairsbreadth wire (0.09 mm) allowed recordings with frequencies ranging from 150 Hz to 3.3 kHz. The small size and the limited electronic possibilities meant that the Miniphon could only be used as a dictation device, although one spool of wire could be used for up to 300 minutes of recording at a wire speed of 20 cm per sec.

production: Protona GmbH, Hamburg 1951–1957
material: Plastic, wire spools, batteries, three earphone tubes (DF67)
Lender: Vienna Museum of Technology

#22

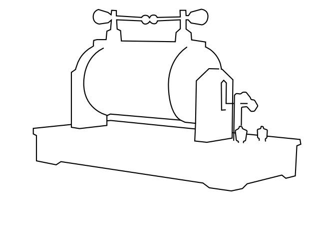


DF 40 WIRED RADIO RECEIVER
Siemens & Halske AG
Berlin around 1939

Wired radio is the term used to describe any long wave, occasionally also medium wave transmission of information by means of modulated oscillations via electricity and telephone lines using the carrier frequency method. These transmissions can be received by inserting a frequency-separating filter between the line and the receiver.

production: Siemens & Halske AG, Berlin around 1939
material: Wood, loudspeaker, signal amplifier, tube technology
Lender: Vienna Museum of Technology

#23

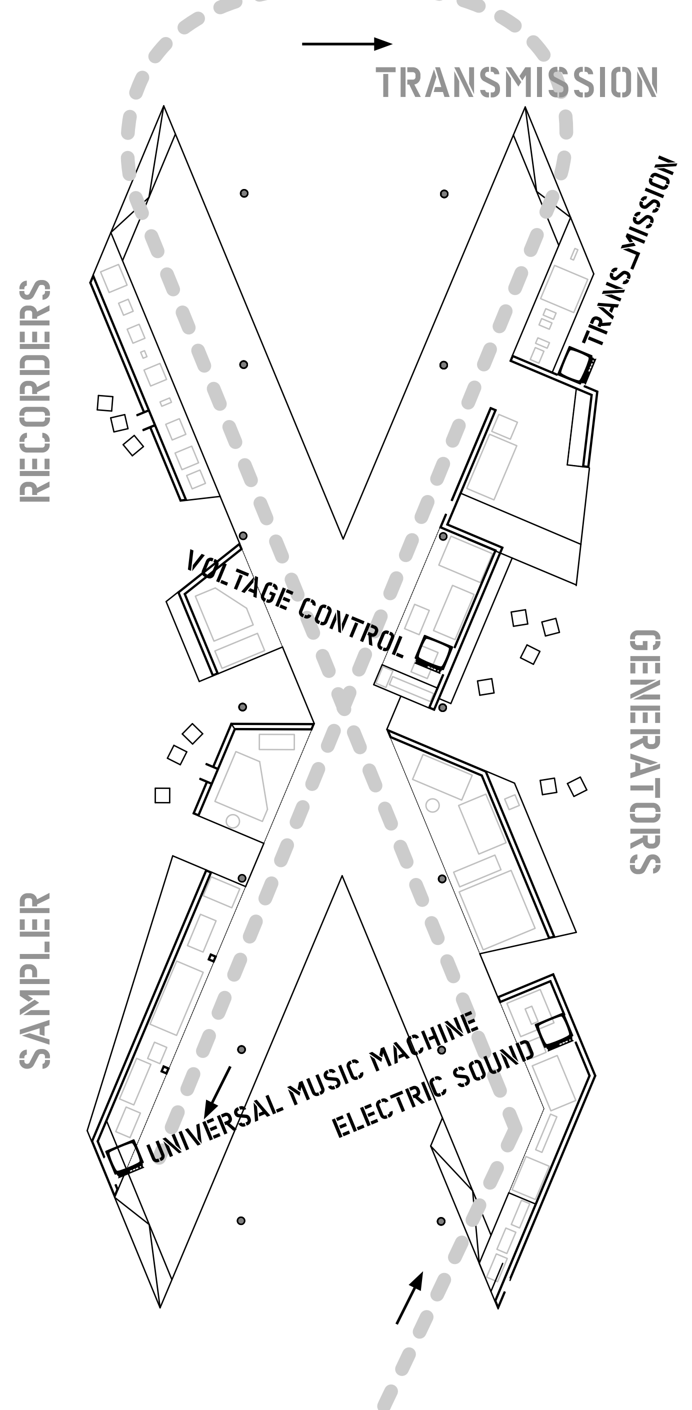


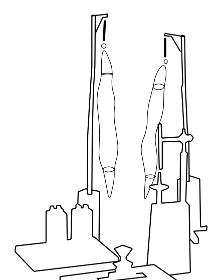
POPOV RADIO SYSTEM
Alexander S. Popov
Kronstadt 1895

This wireless transmission system consists of a radio transmitter (Ruhmkorff coil) and a receiver with coherer to register electromagnetic oscillations made audible by a sequence of sounds on an electric bell. If the transmitter button is pressed briefly, the receiver replies with a single ring, while if the key is held down, the receiver produces a series of rings. The coherer must be shaken to resensitize it, which happens automatically when the bell hammer taps the bell.

production: Popov Radio Receiver, A. S. Popov Central Museum of Communications, St. Petersburg 1978
material: Radio transmitter (Ruhmkorff coil, blocking capacitor), receiver (coherer, amplifier, electric bell, aerial)
Lender: A. S. Popov Central Museum of Communications, St. Petersburg

#24



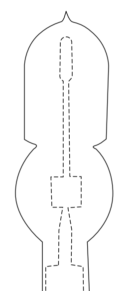


NUSSBAUMER SYSTEM
Otto Nussbaumer
Graz 1904

This device uses electrical waves to transmit sounds over a distance of 30 meters. The high-frequency short wave trains of the transmitter are primarily broadcast at twice the basic frequency of the sound transmitted, causing the membrane of the headphones of the receiver system to vibrate at the same frequency. Additional interpolated arc-overs generate the harmonics typical of the sound of musical instruments and hence wave trains if these harmonics – like the fundamental vibration – also produce sufficiently strong current fluctuations at the inductor input and thus additional arc-overs on the secondary side.

material: radio inductor, radio transmitter (capacitor), coherer, two aerials
Lender: Vienna Museum of Technology Ernst Strouhal, Vienna University of Applied Arts

#025



LIEBEN TUBE
Robert Lieben
Vienna 1906–1910

This was the first attempt to make an amplifier tube. It was developed from the quicksilver vapor-filled tube and was based on various forms of a gas discharge that was altered by means of a voltage applied to the sieve-like aluminum plate. This controlled the current between the anode and the cathode. The tube reacted slowly due to the rather lethargic charging of the chamber and it was only once the device later was modified through the use of a grid and high-vacuum tubes that it could be used in practical application.

production: Allgemeinen Elektrizitäts-Gesellschaft, Berlin, around 1912
material: Glass, metal
Lender: Vienna Museum of Technology

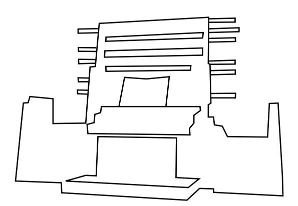
#26

SECRET COMMUNICATION SYSTEM
Hedwig Kiesler-Markey (Hedy Lamarr) and George Antheil, 1942

In 1941 the actress with the stage name Hedy Lamarr and the composer George Antheil filed a patent for a method of encrypting radio signals. The carrier signal was to be repeatedly switched between frequencies synchronically in both the transmitter and the receiver ("frequency hopping"), which would guarantee security against interception. The idea arose during an attempt to synchronise 16 reproduction pianos at a concert by Antheil. Originally the method was only used infrequently (the Cuba missile crisis in the 1960s), but today it plays a significant role in mobile phones, Bluetooth, WLAN etc as a means of increasing the throughput speed for data.

Patent for a "Secret communication system"
US 2292387
Lender: United States Patent and Trademark Office

#027

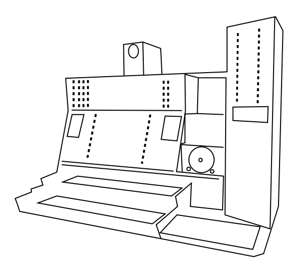


TELHARMONIUM II
Thaddeus Cahill
Washington, 1897-1902

The second telharmonium's 185 hp motor drives 145 toothed AC generators (dynamos) on 8 steel shafts to generate a sinus output voltage. The eight basic notes (C, D, Eb, E, F, G, A, Bb) can each be used to generate 16 harmonics. The resulting sound mix (up to six octaves) is output over two channels (melody and bass accompaniment) and transmitted to telephone receivers with horns via the telephone wires. At least two musicians were needed to operate the two keyboards, the pitch and volume pedals and up to 11 switches per key to mix sounds.

production: Thaddeus Cahill, Holyoke (USA) 1903–1906
material: wood, console with three five-octave manuals (144 keys each, up to 36 keys for one octave), toothed AC generators, motor, water-cooled, ca. 2,000 relay circuits, telephone lines, telephone receiver with horns

#28

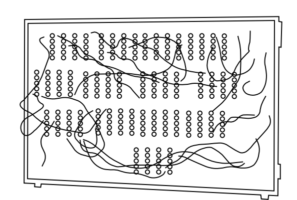


MAX BRAND SYNTHESIZER
Max Brand
New York, 1957–67

Main module is a master oscillator with a frequency divider, the basic frequency of which can be changed using an external control voltage. The frequency divider generates four subharmonic vibrations, the volume shares of which can be regulated separately in three blocks by a matrix and can be accessed via the pedals. All the modules are provided twice in symmetrical arrangement, so that the machine is divided into an upper and lower manual.

material: wood, metal, keyboard, bandmanual, pedals, patch board, mixer, voltage controlled oscillator, low frequency oscillator, ring modulator, lopass filter, envelope generator, frequency divider, formant filter, tubes, transistors
Lender: Max Brand Archive, Langenzersdorf (Austria) / Vienna City Library, City Hall, Music Collection

#029

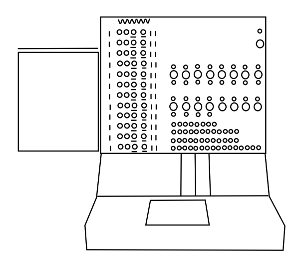


DOEPFER A-100
Dieter Döpfer
Gräfelfing, 1995 - 2008

The A-100 is an analog modular system with over 100 different possible modules developed between 1995 and 2008. It is an open system with modules that can be used in any combination. All known standard synthesizer modules are available.

material: metal casing, voltage-controlled oscillators (VCO), voltage-controlled filters (VCF), Vactrol filters, morphing filters, wasp filters, Parker/Steiner filters, multiple resonance filters, 15-section filter bank, voltage-controlled amplifiers (VCA), envelope generators (ADSR, AD, AR, multistage ADADADAD generator), modulation oscillators, ring modulator, noise generator, sequencer, Vocoder, spring reverberator, phaser, voltage-controlled Bucket Brigade Device, sampler, digital noise generator, envelope follower, waveform multiplier, sources of uncertainty, sample&hold/track&hold, slew limiter, analog shift register, quantizer, voltage-controlled switches, voltage controlled frequency divider, phase locked loop/PLL, Maximum/Minimum detector, trigger delay, ribbon play manual, Theremin controller, joy-stick midi-interface
Lender: Doepfer Musikelektronik GmbH, Gräfelfing (Germany)

#30

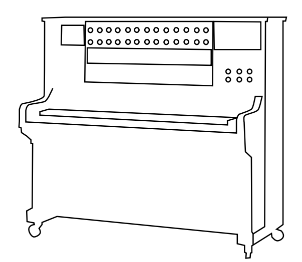


HÖNIG-SYNTHESIZER
Heinz Hönig
Graz from 1965

The control voltages and trigger impulses generated by the SYM microcomputer can be attributed to the envelope generators, LFOs, sample & holds, filters and oscillators on the matrix plug board and the patch bay. The EMC Compiler composition software developed for this machine by the composer Helmuth Dencker allows the use of a variety of algorithms (tendency, loop, random, transposition) – a hybrid system for complex compositions (without tape splicing and with purely analogue synthesis).

material: metal, sound frequency unit (eight voltage controlled oscillators, twelve amplifiers with envelope generators, eight filters, three ring modulators and impulse and noise generators), control voltage unit (four digital 12-bit low-frequency oscillators, sample & hold, envelope tracker, control voltage mixer), control computer (SYM) with 6502 CPU, eight 12-bit digital-analogue converters, twelve trigger impulse outputs, software), matrix plug board (4 x 16 x 16), sound and control voltage patch bay
Lender: IEM Graz

#31

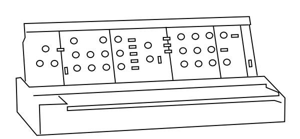


AKAPHON
Hellmut Gottwald
Vienna 1963

The 13 keys of the keyboard activate the 13 oscillators. The frequencies of the individual oscillators can be selected freely by means of potentiometers. Each oscillator has its own low-frequency oscillator and variable filter functions for structuring the sound. The system is designed to be easily adaptable to individual needs.

production: Hellmut Gottwald, Vienna 1963
material: wood, keyboard, 13 oscillators with modulators, transistor technology (germanium transistors), tube amplifiers, opto-couplers
Lender: Vienna Museum of Technology

#32

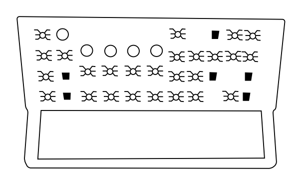


MINIMOOG
Robert Moog
New York 1969

The first portable analogue synthesizer for the stage has three voltage-controlled oscillators (one of which is frequently used as LFO), a noise generator for white and pink noise, a mixer, and a low-pass filter with adjustable resonance connected to a voltage-controlled amplifier. Filter and amplifier each have their own three-parameter envelope generator (attack, decay, sustain). External signals can be processed with the filter via the external input. Two modulation wheels can be used to regulate pitch and the degree of modulation respectively. Pitch, volume and filter can also be controlled using external (control voltage) inputs.

Minimoog Model D, New York 1979
material: wood, metal, keyboard, voltage-controlled oscillators, low-pass filter, noise generator, amplifier, envelope generator, semi-conductor technology
Lender: Eboardmuseum, Klagenfurt (Austria)

#33

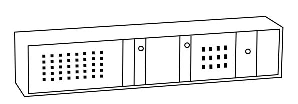


POLYVOX
Vladimir Kuzmin
Sverdlovsk, 1982

The signals of this analogue synthesizer are processed in the mixer together with any external input and are then fed through the filter unit, which can be switched between bandpass and lowpass. It is duophonic, with one oscillator being played on the keyboard with rising notes, and the second played with descending notes in parallel. A switch is used to select one or two voices. It is also possible to switch the four-octave keyboard from lasting sound to touch-sensitive sound.

production: Vektor Company
material: Plastic, metal, keyboard, two broadband generators, noise generator, resonance filter, modulators, mixer, amplifier
Lender: Elena Tikhonova / Dominik Spritzendorfer, Vienna

#34

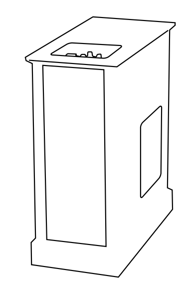


MOOG MODULAR SYNTHESIZER
Robert Moog
New York 1963/64

The modular system consists of a number of various modules, which are mounted in a cabinet and can be used in any combination. Each module performs a specific signal-generating or modifying function. Voltage-controlled oscillators (VCO) which produce the waveforms, amplitude modulators (VCA), filters (VCF) or fixed filter banks, and envelope generators (ADSR) are connected with patch cables and by acting upon each other offer endless possibilities for creating sounds.

production: Robert Moog, New York 1973
material: Wood, metal, keyboard, sequencer controller (960), sequencer switch (962), dual trigger delay (911A), interface (961), oscillator (921B), fixed filter bank (914), reverberation unit (905), semi-conductor technology
Lender: Eboardmuseum, Klagenfurt (Austria)

#35

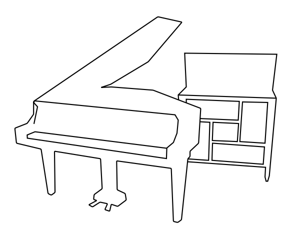


WURLITZER SIDEMAN
Wurlitzer Company
Corinth, 1959

12 electronically generated predefined rhythm patterns can be played at various speeds. A circular disk is divided radially into 48 sections to create the rhythms, the 10 different combinations of sounds being triggered by contact points in five concentric circles, and read by a rotating comb. The sounds are generated by the tube generators in accordance with the pattern selected.

production: Wurlitzer Company, Corinth 1963
material: wood, belt driven motor, metal disk, printed circuit board, tube generator, tube amplifier
Lender: Eboardmuseum, Klagenfurt (Austria)

#36

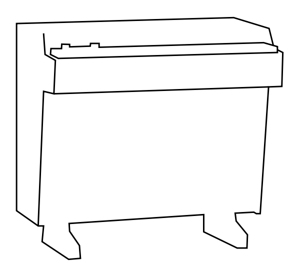


NEO-BECHSTEIN GRAND
Paul Ehrlich,
Leipzig 1882

Without a sounding board and extremely lightweight in construction, this baby grand uses a special mechanism design with "micro-hammers". The sound is picked up by magnetic coils, five notes per coil. Playback requires a tube amplifier and a loudspeaker case placed separately. The sidewall of the piano contains a radio, and the loudspeaker case is fitted with a gramophone. It is thus a combined instrument, and a number of components can also be played together.

production: Petrof, Königgrätz 1932
based on ideas by Walter Nernst et al.
material: Wood, cast-iron frame, steel strings, telephone magnets, Telefunken radio, gramophone, semiconductor amplifier (addition)
Lender: Vienna Museum of Technology

#37

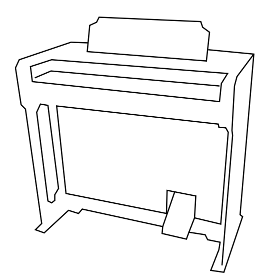


MELLOTRON
Bradley Brothers / Harry Chamberlin
California 1946

Each of the mellotron M400's 35 keys uses a separate section of tape (3/8") that produces a sound for a maximum of eight seconds after the key has been pressed. When the key is released, a spring mechanism returns the tape to the starting position. The tapes are arranged in a frame, with three different sounds recorded on each tape, selected by shifting the playhead. The frames of 35 tapes can be exchanged for different tapes. A control card allows volume, pitch and track to be set.

modell Mellotron M400, Streetly Electronics (Bradley Brothers), Birmingham 1972
material: wood, metal, keyboard, magnetic tapes, tape frame, sound heads, CMC-10 control card
Lender: Eboardmuseum, Klagenfurt (Austria

#38

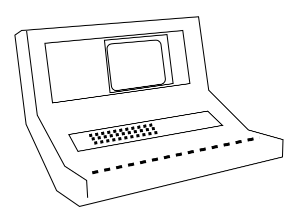


OPTIGAN
Thomas Alva Edison,
Menlo Park, USA 1877

The Optigan (= OPTIcal orGAN) is a late descendant of the light-sound instruments. A rotating twelve-inch plastic disk encoded with 57 concentric soundtracks for melody and accompanying instruments is read by a photoelectric cell. The left hand uses buttons to select one of seven different chords (major, minor or diminished) or a variety of percussion or sound effects, while the right hand can play a melody on the three-octave keyboard. A large number of arrangements were available on disk.

production: ca. 1972, Matell Inc., California, on behalf of various inventors, 1970
material: particle board, plastic keyboard, plastic printed optical disks, semiconductor amplifier, loudspeaker
Lender: Vienna Museum of Technology

#39

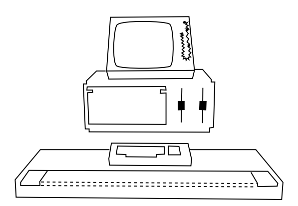


AKA 2000
Peter Mechtler
Vienna 1975-1985

The music computer with sampler function can store and process sound files up to 1 MB in size. The sampling rate can be varied (20–50 kHz), quantification is 16 bit. The sound file can be structured into segments (minimum 1 sample) that can be called up and combined freely.

production: Peter Mechtler, Vienna 1975-1985
material: aluminum, steel, control panel with keyboards and controllers, color monitor, microprocessors (8 bit, 16 bit, Z80, M 68000), floppy drive (8"), Winchester hard drive (10 MB), AD/DA converter (16 bit)
Lender: Vienna Museum of Technology

#40

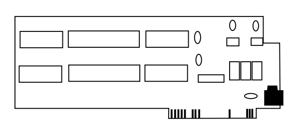


FAIRLIGHT CMI
Peter Vogel /
Kim Ryrie
Sydney 1979

This eight-voice digital sampler and synthesizer with its analogue-digital converters (8 bit) and a sampling frequency of up to 24 kHz (later 30.2 kHz) can store and process audio data and generate sounds by means of additive synthesis. Operation is menu-controlled (either by light pen or alphanumeric keyboard). A total of 19 menu pages are available. The MCL (Musical Composition Language) programming language specially developed for this machine allows very complex compositions, while the Real Time Composer provides a pattern-based real-time sequencer with eight tracks and numerous editing functions.

production: Fairlight Company (Peter Vogel, Kim Ryrie)
Metal, processors (Motorola 6800), 816 kB RAM audio cards, two floppy disks (8"), keyboard, alphanumeric keyboard, monitor with light pen
Lender: Maria Bognermayr, Linz (Austria)

#41



MOCKINGBOARD V1 SOUND CARD
Sweet Micro Systems
USA 1981

The v1 is a clone of the Mockingboard A, a sound card for the Apple II family. The Mockingboard needs its own loudspeaker and cannot use the internal Apple loudspeaker. It is a six-voice two-channel synthesizer, the sound being generated by means of three independent sawtooth generators for each chip. Up to two speech synthesis chips can be added.

production: GSE-Reactive, Cherry Hill (USA) 2005
material: two sound chips (AY-3-8913) for six audio channels, two sockets for speech synthesis chips (SSI-263)
Lender: Vienna Museum of Technology

#42

VERGESSENE ZUKUNFT #1
zauberhafte Klangmaschinen

EXHIBITION PARCOURS OBJECT DESCRIPTIONS