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## **ELECTRONIC BAYAN (ACCORDION) IN MUSICAL CULTURE: HISTORY, AESTHETICS, ORGANOLGY.**

**The aim of the work.** The article discusses historical facts, aesthetic and technological foundations of the emergence, modernization and distribution of electronic instruments, in particular, the accordion. **The methodology of the study** is the use of comparative, aesthetic-cultural, historical, musicological methods that form a single methodological basis. This methodological approach allows to reveal and analyze the specifics of electronic tools in the course of historical modernization. **The scientific novelty of the work** is to identify the value of the electronic accordion in the art of music. The historical and factual and technical-organological parameters of this type of instrumentalism. **Conclusions.** The concept of musical and instrumental computer technologies as a new phenomenon in art reflects the laws of the historical evolution of musical instruments (the process of accelerating changes in musical styles and creative methods of writing music). The specific advantages of synthesizing acoustic and electronic systems in the bayan are indicated.

**Keywords:** electronic musical instruments, button accordion, electronic button accordion, organology, modernization of a musical instrument.

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**Електронний баян у музичній культурі: історія, естетика, органологія**

**Мета роботи.** У статті розглядаються історичні факти, естетичні і технологічні засади виникнення, модернізації та розповсюдження електронних інструментів, зокрема баяна. **Методологія дослідження** полягає в застосуванні компаративного, естетико-культурологічного, історичного, музикознавчого методів, які утворюють єдину методологічну основу. Зазначений методологічний підхід дозволяє розкрити та піддати аналізу специфіку електронних інструментів в ході історичної модернізації. **Наукова новизна** роботи полягає у виявленні значення електронного баяна у музичному мистецтві. Уточнюються історико-фактичні та техніко-органологічні параметри вказаного виду інструменталізму. **Висновки.** Концепція музично-інструментальних комп'ютерних технологій як нового явища в мистецтві відображає закономірності історичної еволюції музичного інструментарію (процес прискорення зміни музичних стилів і творчих методів написання музики). Вказані конкретні переваги синтезування акустичної та електронної систем у баяні.

**Ключові слова:** електронні музичні інструменти, баян, електронний баян, органологія, модернізація музичного інструмента

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**Электронный баян в музыкальной культуре: история, эстетика, органология**

**Цель работы.** В статье рассматриваются исторические факты, эстетические и технологические основы возникновения, модернизации и распространения электронных инструментов, в частности баяна. **Методология исследования** заключается в применении сравнительного, эстетико-культурологического, исторического, музыковедческих методов, которые образуют единую методологическую основу. Указанный методологический подход позволяет раскрыть и подвергнуть анализу специфику электронных инструментов в ходе исторической модернизации. **Научная новизна работы** заключается в выявлении значения электронного баяна в музыкальном искусстве. Уточняются историко-фактические и технико-органологические параметры указанного вида инструментализма. **Выводы.** Концепция музыкально-инструментальных компьютерных технологий как нового явления в искусстве отражает закономерности исторической эволюции музыкального инструментария (процесс ускорения изменения музыкальных стилей и творческих методов написания музыки). Указаны конкретные преимущества синтезирования акустической и электронной систем в баяне.

**Ключевые слова:** электронные музыкальные инструменты, баян, электронный баян, органология, модернизация музыкального инструмента

**Relevance of research topic.** In the musical life of the last decades a new class of electronic musical instruments, which became one of the products of the industrial, and,

however, the electronic, digital revolution is becoming developed and more spread. These electronic instruments are rapidly improving today with the development of computer technology. After all, the speed and technological capabilities of the computer over the past two or three decades has increased by hundreds of thousands of times. This means that already today a wide range of musicians are available for musical instruments associated with these processes, which differ not only by significant expressive resources, but also by completely new timbral qualities. With their help, they achieve orchestral multi-temporal saturation of the texture, unprecedented new timbres and sounds, poly-rhythmic formations that contribute to the liveliness of composer and performance outputs. Synthesizers with a piano keyboard today become almost children's toys.

The acoustic bayan, modernized to modern capacitance in texture and articulation, an orchestral look a little over a century ago (from 1908), from the patent of K. Demian to the "accordion" in 1829, was the world's first acoustic musical "synthesizer" - the mechanics of his left keyboard assumed the combined sound of three-sound (first only major) chords in a certain range at pressing, with the simultaneous movement of the blade, one button (another interesting acoustic synthesizer - Batish-Ton, the invention of O. Batishchev - combined instrument, which included bayan, piano with air attachment and rubber tubes, in which the air supply was ruled by the left keyboard of bayan; violin bow with the wheel and mechanical fingers which were guided by air from the right keyboard of bayan) [myrek].

Subsequent upgrades of the accordion-bayan themselves occurred by increasing the range of both keyboards; adding metal voices when opening one valve to change and enhance the sound, including the use of the registers-switches; the expansion of harmonic accompaniment due to the introduction of minor chords, dominant and reduced septacords. But the principle of multi-voice sounding on one button (key) remained intact. The installation in the left keyboard of the so-called elective (melodic, type "left as a right") system in pure form was preserved only on concertines and bandones, on the bayans such a system without the possibility of switching it to "ready" (with chords) "lasted" since 1910 by the 1930s and was not spread among the performing community. In addition, from the middle of the nineteenth century the right keyboard also synthesized, as a rule, the sound of several voices "in the bottling", in combination of a straight and broken deck; with an upper or lower octave, a quintile.

The overlay on such an acoustic "synthesizer" of electronic sounds was a specific direction of instrumental performance. We should note that managing the rich sound capabilities of the electronic bayan is both more affordable and more complex than playing traditional instruments. On the one hand, the number of technical problems (virtuosity, texture, enrichment with accompaniment and shock) the electronics takes in itself; on the other hand, the management of the midi-system creates additional tasks and difficulties of switching, combining, and knowing. But, of course, it provides a lot of still unvalued and even unknown benefits to the composer and performer. All this creates the relevance of scientific research of the given direction of musical culture from musical and performing positions.

**The purpose of the work** is to determine the main historical, factual, aesthetic and technological foundations of the emergence, modernization and distribution of electronic instruments, in particular, the bayan, as an embodiment of a fundamentally new, perspective means of artistic embodiment in the aspect of the search for a "new sound" relevant to the fluid age [the theory of comp, p. 50].

**Presenting the main material.** The earliest mention of the "meeting" of music and electricity (not electronics) dates back to 1761, when J. de Laford received a patent for an "electric" harpsichord, the mechanics of which were activated by electromagnets operating on galvanic batteries. In 1837, K. Paige opened the principle of electronic tuning fork. E. Lorenz, in 1885, patented the method of sound production using an electromagnet. But all this was not yet related to music as an art, working at the level of scientific experiments. The first electromechanical musical instrument, the sound of which was heard by the audience, was created by American Tadeusz Cahill in 1906 (his first invention called the dynamophone was patented in 1897) for the purpose of creating and distributing music with the help of electricity (a kind of "crossing" principles of the alternator and telephone). The instrument was called the Telharmonium, which consists of the English word telephone and the Latin harmonium, and weighed 200 tons. Based on electric generators and tonal wheels, Cahill reproduced various sounds. Everything was controlled by three modified active keyboards. However, the great strength of the Telharmonium interfered with the work of telephone lines, the performers (there were only two of them) complained about external calls and economic issues were not formed. So in 1916 the tool was silenced.

However, already in 1919, the Russian inventor Lev Sergeyevich Termen created a compact thermenvox, which is still used by some musicians. The uniqueness of this tool is

that sound control occurs as a result of the free movement of the performer's hands in an electromagnetic field near two metal antennas. The change in the height of the sound is achieved by approaching the hand to the right antenna, while the volume of the sound is controlled by the approach of the other hand to the left antenna. Treacherous effects, sounds of the cosmos, the approach of something unidentified - the termenvox is used for all. Hitchcock used it to record the soundtrack for the films "Birds" and "Fascinated". Friedrich Trautewine constructed a trautionium in the 1930s - a box with a "lamp generator": electric bulbs that appear in the lamp, turned into sound. The next step was the invention L. Hammond – the engineer and owner of the company. As a result of the work of the whole team, it was possible to mix simple "fundamental" sounds with overtones and control the volume of each of these components, which influenced the richness and brightness of the tone. In 1934, the invention was patented, and the organist Louise Benke demonstrated it. The electronic organ of Hammond issued 253 million sounds, won the dispute for the right to be called the organ along with the wind instruments and "settled down" in numerous churches and professional rock studios: "Beatles" used it in such albums: "Rubber Soul", "The Beatles'68" , "Abbey Road" and "Get Back"; and "Pink Floyd" used it in their final composition "Echoes" from the album "Meddle" (a strange sound that "drips" at the beginning of the work).

An example of the installation of "electrosound" was first demonstrated by the German acoustic of the University of Bonn, Werner Mayer-Eppler, at the Summer Courses of Modern Music in Darmstadt in 1951, which was of great interest. Next to the Center of Electronic Music at the University of Bonn, an Electronic Music Studio at the Cologne Radio was created [bunches, p. 23-24]. Here, under the artistic leadership of Herbert-Ammert and Karlheinz Stockhausen, the composers and theorists, a group of jealous electronics supposedly formed, joined by Herman Hayes, Paul Gredinger, Henri Pusser, Pierre Bulez. The second wave of avant-garde stimulated the search for new sound instruments in the field of electric tools. And achievements in the field of electronics have given a new impetus to the emergence and development of various musical creative areas (electronic and specific music). In the late 1940s and early 1950s, electronic music existed in three areas related to the aesthetics of prominent avant-garde composers - Pierre Scheffer (strict selection of mostly unprocessed sounds of the real world - "specific music" based to "use of fixed sounds instead of notation" [garb, pp. 508]); Karlheinz Stockhausen (musical instruments and receptions that are created only by means of electricity, sound synthesis and do not exist in nature); the

American branch - Volodymyr Usachevskyi and Otto Layoning - used the processed sounds of traditional musical instruments.

In 1959 (the idea was born in 1938 but did not get the support), Eugene Murzin constructed the world's first polyphony synthesizer called "ANS" ("Alexander Nikolayevich Scriabin" - due to the connection of the visible and the sonorous). The principle of operation is based on the optical recording of the sound used in the cinema (photomultiplier). In the 1960s, an experimental studio of electronic music was opened in Moscow, where the synthesizer "ANS" started to be used, working on their musical works, by S. Gubaidulina, A. Schnittke, E. Artemiev. In 1968, the Moscow experimental studio of electronic music, together with the "Melody" company, released the disc "Space" with an absolutely new music for that time with the participation of this unique synthesizer. In the future, the invention of the transistor was influenced by the improvement and development of electronic musical instruments. The synthesizers started to have such a size that was convenient for the artists. They began to be constructed from separate blocks. Now, using standard elements, they began to manufacture tools that had different characteristics.

In 1962, in Italy, the synthesizer "Sinket" for the "live" electronic music was invented by the engineer Paolo Ketoff. The tool had three keyboards, each with a certain tone. In 1964 the synthesizers of Americans Robert Moog (piano keyboard for the traditional play) and Donald Buchli (mobile keys were replaced by sensors that worked from the touch) appeared. Moog founded his company. In 1968, on his analog synthesizer, Wendy Carlos recorded a music translation of J.S. Bach, and that disk received the Grammy Award and made Moog famous. In 1970, his first compact synthesizer Mini-Moog went onto the markets. Soon, the synthesizers of Moog were carried away by the leading rock groups of the time - "The Beatles", "Rolling Stones" and "Dorzi". Despite the fact that the analogue of "Moog" can now be found only in museums, their digital descendants are widely used by contemporary musicians in a variety of genres. Today the leading world firms Yamaha, Casio, Korg, Roland, and Kurzweil produce synthesizers of initial, semi-professional and professional levels.

All described instruments had organ-piano keyboard, as the embodiment of the universal orchestral type of thinking. The development of microelectronics and the emergence of integrated circuits greatly influenced their development. The sound began to be controlled through digital control methods, and the sound itself changed to a digital look. Until the 80s,

similar synthesizers were mostly created. The electrical oscillations in their shape resembled the sound waves of acoustic instruments. Digital synthesizers, as well as digital music systems, generated a series of numbers. These numbers were converted into electrical oscillations and came into the speakers (dynamics). At the end of the 80s, computer technology combined with the technology of digital audio recording and digital synthesis into one whole system. Musical instruments produced on this principle have got a new name - digital music workstations (with built-in sequencer).

Nowadays, there are two areas of distribution and development of instruments in this group: MIDI (Musical Instrument Digital Interface) - instruments (keyboards) and electronic (digital) musical instruments. By the end of the 1970s, the synthesizers were sets of voltage-controlled audio frequency generators. Pressing a key on the keyboard of the synthesizer switched on a generator, the frequency of which was given by the voltage from the regulator of the tone of this button. The number of individual generators determined the number of tones of the synthesizer, which may sound simultaneously. Specific models of synthesizers could have their own peculiarities of sounding and special effects only for them. Implementing the management of all the diversity of potential audio synthesis capabilities within a single analog device was impossible. The musician's workplace, as a rule, consisted of several heterogeneous synthesizers, each of which could generate only one spectrum of sound oscillations - it was extremely difficult to handle such a variety. By the beginning of the 1980s, the need to increase the convenience and flexibility of controlling heterogeneous synthesizers became apparent, and the development of electronics and further computerization suggested a way to solve the problem with the help of digital software control. Manufacturers managed to agree on the development and maintenance of a single interface standard (a set of tools, methods and rules of interaction between the elements of the system) synthesizer management, which appeared in 1982.

The standardization requirement involved the division of control bodies and sound synthesis devices. The MIDI interface actually became a means of transferring the position of keys and controls from the keyboard to the very device of synthesizing sound. From now on, a musician could only manage one or more different types of synthesizers and producers with just one keyboard. Moreover, the digital format of the transmission allowed to supplement the equipment with sequencers - devices that remember the played melody. The musician could record songs or parts of them, mix them without loss of sound quality and use of

sophisticated studio tape recorders. The standard quickly got the market. In the future, adding new, more advanced capabilities and options, he still has not lost relevance in our time.

A new, independent direction in the constructive development of the bayan was the use of sound as the beginning of electronics. There were electronic bayans and accordions. Externally, the electronic bayan is similar to the standard bayan with five-way right and six-way left keyboards, and musicians-bayanists play it (although many musicians view the instrument itself and perform on it outside the bayan arts). Both the music lover and the experienced professional, who first got to the performer's concert on the electronic bayan (or accordion), all heard and seen would be simply shocking for them. After all, modern electronic bayan - is, in essence, an entire orchestra in the hands of one musician. He has thousands of voices: from violin and Hawaiian guitar - to trumpet and harpsichord, synthesizing string sound or any other group of instruments. And against the background of a polyphonic orchestral sound it allows to sing a voice that spells with timbre and dynamics, and finally has an electronic rhythm accompaniment, prefix, imitates the play on percussion instruments. All this opens up to the artist at the electronic bayan truly endless prospects for creative searches.

In the modern performing practice, the MIDI-instrument of the "tongue" group is the instrument itself (in its acoustic form) with its built-in system of contactless sensors located above the valves inside the instrument. A magnet is attached to the valve, which, when approaching the sensor, changes its parameters, in accordance with which the above sensor communicates to the sound module (hardware synthesizer), the number of the key (button) with the sound and the speed of pressing the corresponding key (button). Since a certain sound bank is inserted into a sound module (synthesizer or computer), we can have an infinitely wide palette of voices on the output.

Inside the instrument, an air pressure sensor is also located. Its task is to measure the force applied to the bug (the ability to change the force of sound). Thus, the system allows to supplement the usual acoustic bayan (in itself orchestral) functions of the synthesizer, which greatly extends its timely and textual possibilities.

However, due to the fact that this system involves the presence of numerous and expensive equipment (the instrument itself with its installed MIDI system, the sound module) most often in its role there is the computer with the corresponding program), amplifying and acoustic equipment (speakers). This fact served as a starting point in the development and creation of this kind of system, in which all of the above constituents were concentrated in

one block (case) with minimal involvement of third parties (additional) of accessories. Also, not all sufficiently own a bayan, the piano in this sense is more universal.

In the early 1960s, being the first in the USSR, the industrial electro-musical instrument "**Estradine**" ("Pop Instrument"), which was named "Romance", was created in Zhytomyr at the "Electric Meter" factory. In 1964 the design was shown to the commission, after which on February 12, the Day of Electro Music was celebrated at the factory. The bayanist **A. Gryber** joined the master-engineers **L. Fedorchuk, V. Voloshin, L. Fuchs**. Designers Leon Tolchynskyi and Dima Schreier have developed an original contact system and a panel of switches for controlling electronic sounds, registers and effects in conjunction with the sound of ordinary bayan in addition to the Zhytomyr acoustic serial bayan "Dream". It managed to achieve crystalline purity of sound, thanks to the effects of vibrato, tremolo, percussion, reverb, timbre glissando and rhythmic accompaniment to play the organ, piano, instruments of orchestras - wedding rustic, jazz or pop (1970).

**Anatolyi Belyaev**, being already known as the concert soloist of the Mosconcert, first began to play the electronic accordion without losing the live sound of the instrument in 1964, and from 1979 he started playing the "Clavin" (a combination of a ready-made bayan with an electronic organ, designers Y. Volkovich and A. Yavelov). An instrument with several thousand voices and their combinations, a combination of electronic and acoustic (bang) sounds, memory for the selection with 1 key was made in the Italian firm "Forviza", electronics – Chicago, USA. The presence of a foot pedal allowed not only to regulate dynamic flexibility, but also to create the right balance between voice and accompaniment. There were classic and pop programs.

The five-row electronic bayan "**Topaz**" (Kachkanar radio factory "Formanta", 1970) is intended to simulate the sound of the traditional bayan, uses the register method of synthesis to create sounds of such other instruments, synthesize the timbre, and so on. It has a built-in loudspeaker with level control, simulation of the blade motion in the left keypad, volume control pedal. It uses the following parameters: tremolo frequency, vibrato frequency, vibrato depth, setting, keyboard balance, volume, high / low tone, register switch buttons, speaker cradle and power.

The five-row branded Italian bayan (button accordion) of the legendary Italian **Paolo Soprani** (model Paolo III, C-Griffin) - unlike the Slavonic Bayan B-Griff. This seems to be a

small difference - the first and third rows changed their places - that requires re-training for domestic performers.

Digital bayan **Weltmeister** is equipped with a unique midi-system Blue line - the most advanced and reliable Midi-system (up to 4 Midi channels for the discovery), with improved bubble dynamics, a sensitive multi-level keyboard, convenient software with USB-cable for programming.

The development of **Roland** at the beginning of the 21st century is mainly focused on two areas - firstly, the creation of professional digital music instruments of the "V" series (Virtual). In the instruments of this series, complex mathematical models of real physical processes occurring inside acoustic musical instruments are used. This series features drums (V-Drums series), accordions and bayans (V-Accordeon), pianos and grand pianos (V-Piano). The second area of development is the creation of universal tools and other products (including computer programs, accessories, apps for the iPad and iPhone), aimed at amateur musicians and domestic applications. World-renowned performers Roland V-Accordion - **Sergio Scappini**, **Ludwig Byer**, young people - **Alexei Chernomordikov**, **Stanislav Malyshev**, Odessa bayanist and master **Ivan Siebov**.

Moscow bayanist **Vladimir Butusov** plays the electronic bayans of the Italian company Scandalli, "Jupiter" (the Moscow factory of E. Gusarov), "Tula" and others. Today Roland VK7M also offers the interaction of digital bayan (MIDI-system) with the sound module, which carries the accompaniment, complementing the bayan acoustic functions of the synthesizer. It also offers the creation on the basis of the body and mechanics of acoustic bayan (accordion) to create a powerful electronic instrument, using a new domestic MIDI-system with samples. This is also used by **Aidar Gainullin** - at the Italian bayan Balloni Burini.

**Conclusions.** The invention and further distribution of electricity, "digitization" of the surrounding life. And also the composer's quest for the "new sound" of the second half of the twentieth century served as starting points for the invention and further dissemination of electronic musical instruments. Nowadays, this evolutionary path has undergone virtually all the most common acoustic musical instruments - from guitar, violin, wind, to piano, organ, bayan. Thus, the concept of musical instrumental computer technology as a new phenomenon in art reflects the laws of the historical evolution of musical instruments (the process of accelerating the change of musical styles and creative methods of writing music).

Due to its portability, compactness of keyboards, multi-tabulation, articulation and dynamic flexibility, textured orchestra, ability to sonority diversity, immanent vector of theatricalization (in the very planting, setting, deployment to the listener), genetic roots in the massive genres of bayan in conjunction with electronic capabilities (including the combined acoustic-electronic form) presents a remarkable creative perspective in solo and ensemble performance. The following features of the acoustic instrument are successfully added: a huge, truly inexhaustible variety of timbre, their shades and combinations; the ability to simulate artificial acoustic effects of various types of premises (hall, room, plate, etc.), the ability to record musical text in the form of a sequence of musical events with the reproduction of the sound palette of timbral, metro-rhythmic, dynamic, etc. of musical compositions, the ability to quantize a rhythmic pattern of musical text, which consists in aligning the rhythmic pattern of a melody or invoice accompaniment, converting a MIDI-sequencer into musical text in the form of a clavier, scores, practically unlimited duration of sound.

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