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**FLUTE:
DESIGN, TECHNICAL
AND EXPRESSIVE FEATURES**

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The purpose of the article is to analyse the current developments in the flute construction, outline the essential changes associated with its technical and expressive features, and the prospects for its application in musical culture; to consider the samples of flute modification that were carried out after the T. Boehm's reform. The research methodology consists in using historical and analytical approaches to highlight the features of flute development, as well as a comparative method in the analysis of changes in the flute construction. The scientific novelty of the study lies in the fact that for the first time it outlines various modern modifications of the flute in the historical development of musical culture, and also emphasizes their technical and expressive features considering that modern changes in the flute construction have been insufficiently explored in Ukrainian art studies, in fact, different models of the instrument are only being introduced into the practice of performance. It is noted that changes in the instrument construction are closely connected with the practice of composing, stimulating further strategies for its development. Conclusions. The study shows that the flute is an instrument that has undergone significant changes in its construction. The desire to follow the latest trends in the field of performing and composing art results in the need for further experiments in its construction. The instrument is updated by adding certain devices (microphones), equipment (valves, membranes, keys), and this allows expanding the flute's performing possibilities. A number of contemporary composers write compositions for the updated flute. The use of these instruments is a very promising direction in Ukraine. Knowledge of the technical and expressive possibilities of the flute can provide significant informative material that would be useful for both performers and composers.

Keywords: flute; construction; valve; key; play techniques

Introduction

The flute is an instrument that is commonly used in modern musical culture. Many works that represent the flute as a solo, ensemble and orchestral instrument have been written over the centuries. This process was accompanied by a number of changes in the flute design, which contributed to the expansion of its performing possibilities. Although the flute design invented by T. Boehm was popular, in the 20th – 21st centuries the instrument has been further transformed. The innovations of the flute construction are little known, that is why it is necessary to highlight the technological changes of this instrument.

The influence of modern trends related to the interest in the instruments of ancient design is mentioned in the work of Zh. Zakrasniana. The development of the German flute art of the 18th–19th centuries is deeply studied in the works of V. Kachmarchyk and S. Vitullo. The issue of innovations in the design of the instruments is covered in the article by K. Bijsterveld and M. Schulp. D. Fether outlines the ways of development of modern flute design. Despite the existing works, changes in the flute construction have not yet received sufficient coverage.

The scientific novelty of the study lies in the fact that for the first time in Ukrainian art studies it outlines various modern modifications of the flute in the historical development of the musical culture, and also emphasizes their technical and expressive features. It is noted that changes in the instrument construction are closely connected with the practice of composing, stimulating further strategies for its development.

Purpose of the article

The purpose of the article is to analyse the modern changes in the flute construction, outline the essential changes associated with its technical and expressive features, and the prospects for its application in musical culture, and also to consider the samples of flute modification that were carried out after the T. Boehm's reform.

Main research material

The construction of the flute has been repeatedly changed. The most common model of the flute of the 20th century was preceded by a number of changes to the instrument. Ukrainian researcher V. Kachmarchyk (2009) points out the dominant importance of the Dis flute before the 18th century. Moreover, the use of this instrument affected both the emergence of methodological works, and the fact that compositions were written in the mode that would be easier to perform on this flute. “It is noted that in the first half of the 18th century, virtually the only type of the main instrument and the most common one in the performing practice was the flute with a Dis key. The basic “schools” were created for it, and composers, taking into account the particularity of the flute, used convenient tonality with a limited number of characters” (Kachmarchyk, 2009, p. 6).

Subsequently, various masters and flautists made attempts to change the instrument. J. Tromlitz made the most important contribution to the gradual reform of the flute from diatonic to chromatic. Although the master’s experimental samples became a step forward, but the lack of valve mechanics did not allow them to make a global revolution in flute performance. Instead, T. Boehm made the final transition to the chromatic arrangement of the scale when he created the cylindrical flute in 1847. T. Boehm passed several stages on the way to his tremendous discovery. Researchers of his work distinguish the following inventions: “a) creation of a conical ring-key flute with a chromatic scale and a near to equal temperament; b) creation of a cylindrical flute with a chromatic disposition of the scale on the acoustic basis of an equal temperament” (Kachmarchyk, 2009, pp. 7-8). The introduction of valve covers in the initial open position contributed to the use of the larger tone holes. This aspect of the flute design influenced the fact that they could be closed by any performer, because now the size of the fingers did not matter. It was important to form a consistent chromatic system of valve mechanics.

Although T. Boehm made a real breakthrough in the formation of an improved flute, his work did not become the last point in the development of the instrument. T. Boehm skilfully designed a flute with scientifically based proportions, well thought out and tuned, but a few changes to his model of the instrument became successful. French flute virtuoso Vincent Joseph Dorus (1812-1896) made an important change to Boehm’s flute, replacing the G# key from open to closed. This change became widely accepted in the music world. Italian flautist and composer Giulio Briccialdi very quickly mastered the Boehm flute, but later began to change it. “He designed a lever or key called the Briccialdi Bb key which was added to the left hand thumb. In the original Boehm system there was only one thumb key used for B natural and the first finger on the right hand was added for a Bb. The Briccialdi Bb key has become an important alternate fingering option” (Vitullo, 2013, p. 24).

The flute designed by T. Boehm, created in the 19th century, has maintained its dominant position in musical culture for quite a long time; it still remains one of the basic ones in modern performing practice. However, over the past decades, there have been attempts to reform the instrument. One of the ways was to add certain innovations to Boehm design, mainly preserving the main essential features. In the 20th century, there were attempts to change the flute by adding valves. So, thanks to the developments of Eva Kingma, a new system with six extra keys was arranged. The system, named after its inventor (“Kingma Keys”), was designed to simplify the performance of avant-garde music.

It is well known that in the second half of the 20th century there was the development of various compositional techniques – sonorics, aleatorics, serial and concrete music. The sound spectrum of the instruments begins to change. Composers are looking for the new playing techniques that would help to expand the instrument’s capabilities. The Kingma’s invention made it possible to apply the latest techniques, from playing quarter tones to “multiphonic”. For example, “key-on-key” system was proposed, which without the increase in the size of the instrument, improved it in a new direction. In recent years, composers, mostly from abroad, have begun to write compositions for the flute of the new design. As a rule, they are intended for specific performers and are written on their request. Patrick Nunn wrote “Maqamat” for the Kingma system alto flute and “Into my Burning Veins A Person” for the quarter-tone alto flute, piano and electronics. Daniel Giorgetti’s “Panic and Echoes” is also designed for the Kingma’s alto flute and piano. British composer Andrew March wrote the cycle “Alto Flute and Harp Book: 2001”, consisting of works “XXIX – in Perpetuum” for solo Kingma system alto flute, “Water Lilies” and “Aeolian Rustling” for Kingma’s alto flute and harp, as well as “Memoriam” for Kingma’s alto flute, vibraphone, marimba, harp and the strings.

It is important to note that the need for the flute was prepared by the existing compositional practice. Accordingly, the development of performance, invention and composition were closely interrelated. “Notwithstanding the instrument makers’ inclination to experiment, many of their innovations originated after musicians had pointed out to them particular problems or needs. Eva Kingma’s first big challenge came when

a modern music flautist–composer asked for an open-hole alto flute in order to play glissandi, quarter-tone scales and multiphonics” (Bijsterveld & Schulp, 2004, p. 659). At that time, only C-flutes had open holes. When working with such alto flute, it turned out that it would be harder to close open holes, because the flautist had to have big hands. “Key-on-key” system was invented to solve this problem. E. Kingma received several grants from public and private institutions to implement this project.

Another way of the flute modification was to use elements from the other flute systems, including ethnic ones. Mathias Ziegler, a well-known flautist, uses film membranes that are small in size and identical to those used on the Chinese Dizi flute. Although the musician uses such membranes on an ordinary Boehm flute, the features of the sound are similar to the baroque flute. At the same time, it is necessary to note the influence of ethnic instruments on the formation of the modern sound of the instrument.

M. Ziegler quite often enhances the sound of the flute with microphones, and the distinctive feature is that they are installed not outside the instrument, but directly in it. At the same time, he can add elements of audio processing of the sound, in other words, he works with the created loops. Such devices make it possible to perform cyclic sounds, create polyphony from a single available voice. M. Ziegler notes that the flute can be used as an instrument that has extremely wide capabilities, but they have to be revealed. The flute itself can sound like an orchestra: “All sounds (key noise, winds, tongue stops) usually neglected on the flute are amplified. There is a whole orchestra inside the flute, which allows me to play solo-polyphonic music” (World Renowned Flautist, 2006).

Another design modification of the flute is the use of the construction of Robert Dick, who invented the glissando headjoint. This telescopic headjoint allows playing the descending glissando without much effort. This instrument is used in plays by R. Dick, such as “Felix for Helix” (1998), “Sliding Life Blues” (2001), as well as in the electroacoustic work “Our Other Man” by Alan Lomax. D. Fether in his study “A Discussion of Contemporary Flute Design and the Issues Surrounding these Developments” (2005) notes that the emergence of such innovations can cause a certain negative reaction among performers, because they are often convinced that it is possible to do without creating new designs. However, these improved models allow you to play the same thing, but without much effort. “There are flautists who raise the question that glissando is possible on a regular open model. Indeed there are players who have learned to play smooth glissandi of an octave or more... Pestel describes that such techniques could not achieve the smoothness obtained with the glissando headjoint and the ability it gives the player to glissando downwards from ‘any note and at any speed’ with a consistent tone colour” (Fether, 2005, p. 42).

The development of avant-garde music has intensified the practice of changing the sound of the instrument even without significant design changes. Thus, the introduction of playing the “prepared piano” has increased attention to similar experiments on the other instruments, in particular the flute. M. Pestel promotes the “prepared flute” when various materials are placed in it. For them to remain in the instrument while playing, the artist covers the end of the tube with a membrane (screen). Such placement of alien materials allows getting additional sounds – multiphonics, unusual timbre formations, etc.

In addition, in the late 20th – early 21st centuries with the spread of the movement of “historically informed performance”, attempts were made to revive the instruments of the period of historically informed performance practice – “this is the name that performers who advocate authentic reproduction of Baroque musical works have identified themselves with. Their goal is achieved through long-term research related to the study of the evidence of contemporaries of the Baroque era about the sound of both human voices and musical instruments” (Zakrasniana, 2017, p. 269). It is risky to talk about a complete reproduction of the flute of the Baroque era, but the search data lead to other possible forms of the instrument; their use is appropriate for the music of a particular period of time, taking into account the composition of the other instruments of the orchestra or ensemble. The sound in the Baroque era, according to researchers, was lighter, devoid of excessive volume, but more improvisationally oriented. The use of such instruments implies not only compliance with the authenticity of instruments, in particular flutes, but also the conditions of playing them – in the standing position.

The use of modern instruments for playing the repertoire, which was written much earlier than the specified flute design was created, is, according to S. Maclagan (Maclagan, 2019), not only possible, but also technically easier than playing the original version. It is possible, of course, to achieve a slightly different sound, which will be different from the one produced by flutes of another design. “The flute gained many “new” sounds, but maybe it lost some of the effects” (Maclagan, 2019, p. 372). At the same time, it is advisable to continue the process of the flute constructive changes. Our experience gives grounds to express the following opinion: modern musicians should effectively use all the opportunities that create developments in the flute construction. At the same time, we are also based on the observation of S. Maclagan (2019): “Boehm wanted

to “improve” the flute by smoothing out the intonation, achieving a greater dynamic range and colour homogeneity, and inventing an easy and more logical fingering system that allowed flautists to play without great problems in all tonalities. But I must forewarn you again: every generation of flutemakers and flute players has claimed that their flute was the end point and successful culmination of a long journey” (Maclagan, p. 372). Technology is advancing, the development of performance and compositional practice becomes a factor that encourages the desire to modify the instrument. The “old” is not always a sign of something bad, and the new is not always a positive change. You should not give up the opportunity to improve the sound of the flute, make it deeper, but less tender, more homogeneous, but less colourful, more aggressive, but less soft. Modification of the flute is a permanent process of discovering something new, which can bring the loss of previous qualities, but it is impossible to stop the flute evolution, and this raises the question of whether to accept them or not.

Conclusions

The flute is an instrument that has undergone significant changes in its construction. The desire to follow the latest trends in the field of performing and composing art results in the need for further experiments in its design. The instrument is updated by adding certain devices (microphones), equipment (valves, membranes, keys), and this allows expanding the flute’s performing possibilities. Now composers write compositions for the flute of an updated design, considering the spread of such instruments a promising direction in the world cultural and artistic space.

Prospects for further research are to highlight the key features of the use of new flute designs in the works of contemporary Ukrainian composers.

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ФЛЕЙТА: КОНСТРУКЦІЯ, ТЕХНІКО-ВИРАЗНІ ОСОБЛИВОСТІ

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Мета статті – проаналізувати сучасні конструктивні зміни флейти, окреслити сутнісні зміни, пов’язані з її техніко-виразними ознаками та перспективи використання в музичній культурі; розглянути зразки модифікування флейти, які здійснювалися після реформи Т. Бьома. Методологія дослідження полягає у використанні історичного та аналітичного підходів для висвітлення особливостей розвитку флейти, а також компаративного методу в процесі аналізу специфіки конструктивних змін флейти. Наукова новизна дослідження полягає в тому, що в ньому вперше окреслено різні

сучасні модифікації флейти в контексті історичного розвитку музичної культури, а також наголошено на їхніх техніко-виразних ознаках з огляду на те, що сучасні конструктивні зміни флейти є малодослідженою галуззю українського мистецтвознавства, адже різні моделі інструмента лише набувають впровадження у виконавську практику. Відмічено, що поява конструктивних змін в інструменті нерозривно пов'язана з композиторською практикою, стимулюючи подальші стратегії її розвитку. Висновки. З'ясовано, що флейта є інструментом, що зазнала чималих змін у своїй конструкції. Прагнення слідувати за останніми тенденціями у сфері виконавського та композиторського мистецтва призводить до потреби подальших експериментів у її конструкції. Оновлення інструменту відбувається шляхом додавання певних пристроїв (мікрофонів), устаткувань (клапанів, мембран, ключів), які дають змогу розширити виконавські можливості флейти. Виникає ряд творів сучасних композиторів, які пишуть твори для флейти оновленої конструкції. Перспективним напрямком є поширення даних інструментів в українському просторі. Знання техніко-виразних можливостей флейти може надати вагомий інформативний матеріал, який стане в нагоді і виконавцям, і композиторам.

Ключові слова: флейта; конструкція; клапан; ключ; прийоми гри

ФЛЕЙТА: КОНСТРУКЦІЯ, ТЕХНИКО-ВЫРАЗИТЕЛЬНЫЕ ОСОБЕННОСТИ

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Цель статьи – проанализировать современные конструктивные изменения флейты, определить сущностные изменения, связанные с ее технико-выразительными особенностями и перспективы использования в музыкальной культуре; рассмотреть те образцы модификации флейты, которые были осуществлены после реформы Т. Бема. Методология исследования заключается в использовании исторического и аналитического подходов для освещения особенностей развития флейты, а также сравнительного метода в процессе анализа специфики конструктивных изменений флейты. Научная новизна заключается в том, что впервые обозначены различные современные модификации флейты в контексте исторического развития музыкальной культуры, а также отмечены их технико-выразительные особенности с оглядкой на то, что современные конструктивные изменения флейты являются малоисследованной отраслью украинского искусствоведения, ведь разные модели инструмента только начинают внедряться в исполнительскую практику. Отмечено, что появление конструктивных изменений инструмента неразрывно связано с композиторской практикой, стимулируя дальнейшие стратегии ее развития. Выводы. Выяснено, что флейта является инструментом, подвергшимся значительным изменениям в конструкции. Стремление следовать за последними тенденциями в сфере исполнительского и композиторского искусства приводит к необходимости дальнейших экспериментов в конструкции флейты. Обновление инструмента происходит путем добавления определенных устройств (микрофонов), установок (клапанов, мембран, ключей), которые позволяют расширить исполнительские возможности флейты. Возникает ряд произведений, написанных современными композиторами, для флейты обновленной конструкции. Перспективным направлением является распространение данных инструментов в украинском пространстве. Знание технико-выразительных возможностей флейты может предоставить весомый информативный материал, который пригодится как исполнителям, так и композиторам.

Ключевые слова: флейта; конструкція; клапан; ключ; прийоми гри