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NEW KEY MECHANISM FOR CLARINET

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Summary

A new key mechanism for the clarinet is described, where successively lifting of the fingers causes the production of a scale of whole-tones. By pressing a special touchpiece every whole-tone is increased in pitch by a semitone. Thus each tone has only one fingering, and each finger controls only one touchpiece. All trills are performed with one finger. The instrument is provided with a maximum of 20 tone-holes. For each tone a separate hole exists, so that the instrument can be tuned accurately.

Zusammenfassung

Es wird ein neuer Klappenmechanismus für Klarinetten beschrieben, bei dem durch aufeinanderfolgende Betätigung der Klappen eine Reihe von ganzen Tönen erzeugt wird. Beim Druck auf eine spezielle Taste wird jeder ganze Ton um einen Halbton erhöht. Auf diese Weise gehört zu jedem Ton nur eine Taste. Alle Triller können mit einem Finger ausgeführt werden. Das Instrument kann maximal mit 20 Ganzton-Löchern versehen werden. Zu jedem Ton gehört ein separates Loch, so daß eine genaue Stimmung des Instruments möglich ist.

Sommaire

On décrit un nouveau mécanisme de clef pour clarinette, dans lequel une montée successive de touches produit une gamme de tons entiers. En appuyant sur une touche spéciale, chaque ton entier est augmenté d'un demi-ton. Ainsi, chaque ton a seulement un doigté, et chaque doigt ne commande qu'une touche. Tous les trilles sont réalisés avec un doigt. L'instrument comporte vingt trous au maximum. Il existe un trou séparé pour chaque ton, si bien que l'instrument peut être accordé de façon précise.

1. Introduction

Since its origination, the clarinet has shown a great variety of key mechanisms. Much attention was paid to gain facility of fingering, which was complex due to the fact that the clarinet overblows in odd harmonics, contrary to most other instruments, which overblow in even harmonics. Therefore the difference in height of the first and second register is not an octave, but a twelfth. This implies that the tonal compass to be produced by means of holes is one-and-a-half times larger than in other instruments. It is obvious that the clarinet requires more technique of the fingers than for instance the flute.

In most wind instruments with keys, the successive lifting of the fingers yields a major scale. The semitones in-between are produced with cross-fingering or with separate keys. In the case of cross-fingering, a hole just below the last one opened is closed again. When the holes are dimensioned in the right way, the tone is lowered with a semitone. Mostly cross-fingering causes a poor tone quality and pitch. Thus for semitones separate keys are preferred. Accordingly, the fingers get a double function, which cannot always be fulfilled in fast pieces. To overcome these difficulties, constructions with parallel keys, brills and all sorts of couplers have come in use. The current system shows much analogy with that on the flute. Because of the greater length of the register, the system for clarinet had to be extended at the top and at the bottom of the instrument, which causes an overburdening of the little fingers and of the thumb and index finger of the left hand.

Many inventors have tried to design improvements for the key mechanism. These are described in a book about the clarinet by GEOFFREY RENDALL [1]. The main disadvantages of these improvements were the large number of regulating screws and (in the present author's opinion) the wrong basis for the clarinet, the major scale. The number of tones in this case is too large for ten fingers.

2. The new system

As a basis for the new key mechanism the full-tone scale is chosen, i. e. when lifting the fingers successively, a full-tone scale is produced instead of a major scale. It is then possible to control a range larger than previously, using the same number of fingers. As far as is known, the application of the full-tone scale on wind instruments is new. For the piano this scale was proposed earlier by JANKÓ [1]. Here black and white keys would succeed each other, black as well as white keys forming a full-tone scale. This means a considerable simplification of the technique. The disadvantages for introduction of another keyboard on a piano are that a pianist normally does not play on his own instrument, so that he would be forced to be a virtuoso on two entirely different keyboards. For instruments which are carried about by the musician, different keyboards have no objections, as is proved through the accordeon.

A second feature of the new system is a mechanism with a single control, which by actuation increases the pitch of each whole-tone by a semitone. This special key is connected to 9 keys for semitones, but opens only one, dependent on the positions of the rest of the fingers.

The idea of the single button with more functions is not new. Loos has already described such a system [2], which was based on many springs, overpowering each other, so that the actuation of the button requires considerable effort. The suggested solution, avoiding heavy springs, is in principle already known from the saxophone, where it is applied in the automatic double overblowing hole and works quite well.

It appears that for this system are needed: 8 fingers for the fulltone-scale, one finger for the semitone-key and one finger for the speaker (overblowing-hole) at the same time last tone of the lower register. Study of the table of fingerings (Fig. 1) shows that indeed each finger has only one function. Moreover it is obvious from Fig. 1 that playing in any key has become equally simple, which among other things implies that the necessity for the clarinettist to have two distinct instruments, tuned in B flat and A, has ceased to exist.

The way in which the properties mentioned above are realized will be described now. For each semitone a separate hole is drilled, which may be closed by a key. Four of them, numbered 1, 2, 3 and 4, are visible in Fig. 2. The touchpieces for the fingers are 1 A and 3 A. When released, springs in the direction as indicated by arrows force 1 A and 3 A in the "open" position. Couplers k, attached to 1 A and 3 A, then force keys 2 and 4 to the open position too, because the spings on these keys are weaker than those of 1 A and 3 A. When 1 A and

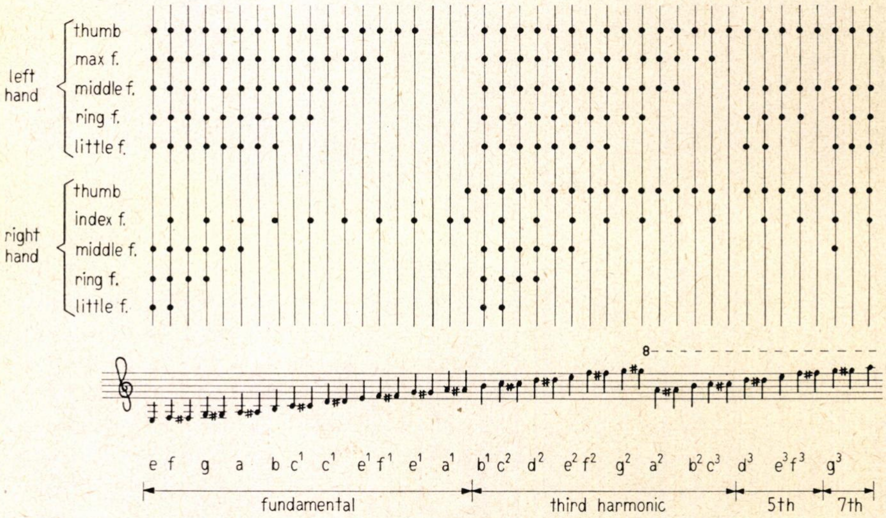


Fig. 1. Fingering chart for the new key mechanism, ● = articulated touchpiece.

[1] It is still advocated by the JANKÓ-Verein, Canongasse 19, Vienna 18., Austria.

3 A are pressed down, 2 and 4 close by their own spring pressure. In that case keys 1 and 2 are closed too, because couplers k force both keys to the closed position. Thus we observe that by successive lifting of the fingers the keys open two by two.

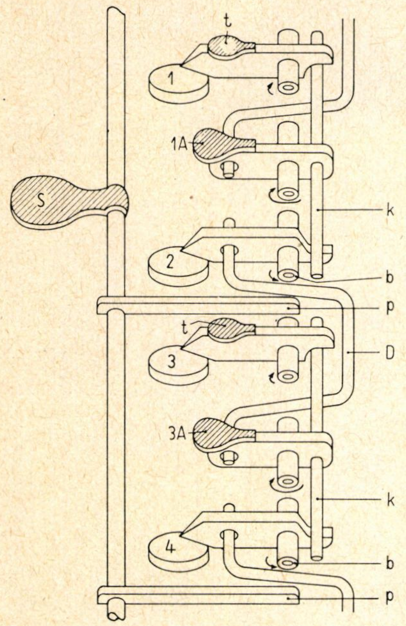


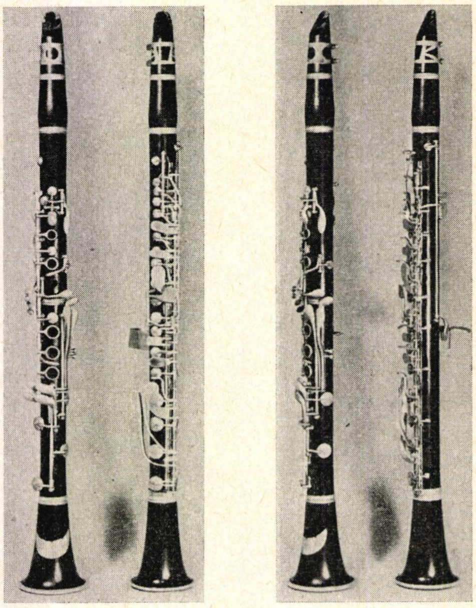
Fig. 2. Exploded view of a part of the new key mechanism.

Next to this row of keys and touchpieces runs a long rod alongside the whole clarinet. By pushing semitone-touchpiece S, attached to this rod, protuberances p press levers D against sleeves b of the even numbered keys. Such a lever is bent in a flat plane and is hanging loosely in two holes; in Fig. 2 in the shanks of 2 and 3 A. If we now for instance imagine a position where 1 A is pressed and 3 A released, 1 and 2 are closed and 3 and 4 are opened. Pressing of S forces lever D against the sleeve of 2. Then key 2 is forced to open, because the lever finds a rotation point against the sleeve of 3 A, and because the spring of 3 A is heavier than that of 2. It may be understood that by pressing of S only a movement in the row of keys takes place at these places where a closed and an opened key are next to one another. Another important possibility of this system is that by giving it some play, the action becomes independent of small variations in the thickness of the pads which must close the tone-holes. This is very important for practical use (musicians often have troubles with regulating screws).

In the new system each tone has its own hole and cross-fingering is avoided. So it will be possible to tune the instrument more accurately and the sound will be more homogeneous.

Study of Figs. 1 and 2 shows that all whole-tone-trills and a part of the semitone-trills can be performed with one finger. For the rest of the semitone-trills two fingers had to be moved up and down simultaneously. To prevent this, separate touchpieces are attached to the odd numbered keys (indicated with t in Fig. 2). This is the only double function of a finger in this system.

According to the new system a B flat clarinet has been built, a first prototype in 1956 in the Laboratory for Technical Physics of the Technological University of Delft. This system is described in a patent application [3] and was slightly different from that described here, but gave essentially the same results. Because of the unnecessary intricacy of this first prototype, later a second prototype was built by the author himself according to the description given before. This clarinet, together with a "simple Böhm"-clarinet, is visible in the photographs of Fig. 3. We



(A) (B) (A) (B)

Fig. 3. Comparison of a simple Böhm clarinet (A) and a clarinet with the new system (B), photographed from different angles.

see that all 20 holes but one are arranged in one straight line. Further it is noteworthy that the thumb rest is larger than normally, which was necessary to give the thumb sufficient mobility to control the speaker hole adequately. Despite the greater complexity of the mechanism, the new clarinet is no heavier than the plain Böhm (800 g).

3. Discussion

An interesting question is the chance of introduction of the new system among musicians. The history shows that alterations in the way of fingering in most cases needed generations before they became generally accepted. In general musicians hesitate to change their habits, once they are accustomed to some system. Accordingly, clarinet-makers hesitate to try rigorous changes in musical instruments.

By giving publicity to the idea [4], [5] the author hopes to excite interest and comments. Besides, it is possible that the system is also suitable for other instruments, e. g. the bassoon. Despite its overblowing in the octave, the bassoon is provided with a key-mechanism that is much more intricate and unpractical than that of a clarinet, mainly due to a considerable downward extension of the lower register. However, musicians claim that the beautiful tone of the bassoon gets lost if the holes are drilled in another than the conventional way. The new key-mechanism would probably necessitate a complete re-arrangement of the holes, and therefore its chances for application on the bassoon seem uncertain.

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References

[1] Geoffrey Rendall, F., The Clarinet. Williams and Norgate Ltd., London 1954.

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[4] Nederveen, C. J., Mens en Melodie **12** [1957], 372.

[5] Nederveen, C. J., Symphonia **34** [1957], 167.