March 31, 1953 L. F. SUTTER 2,633,048

KEYING MECHANISM FOR CLARINETS

Filed Dec. 15, 1951

Fig. 1

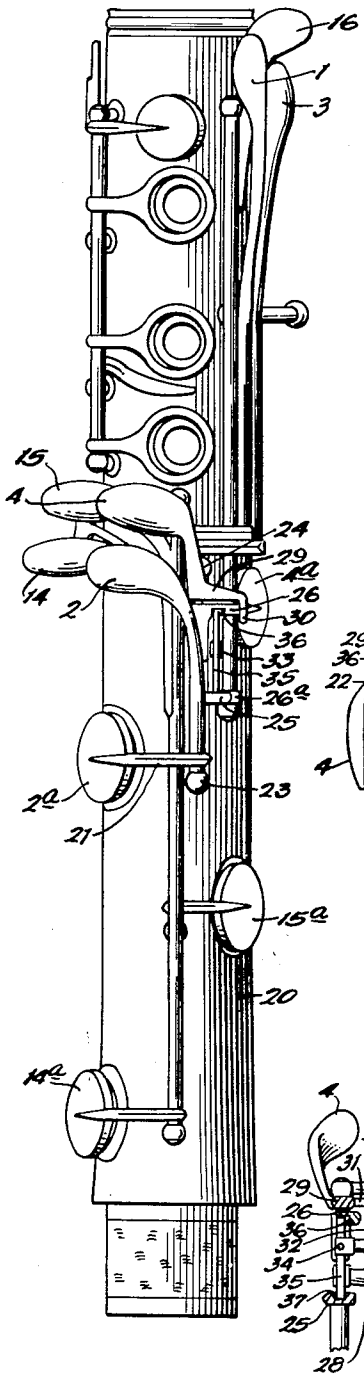


Fig. 2

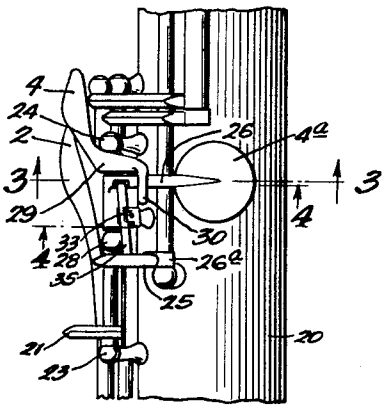


Fig. 3

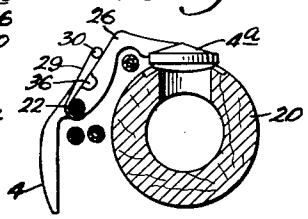


Fig. 4

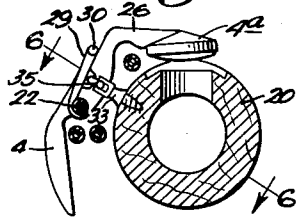


Fig. 5

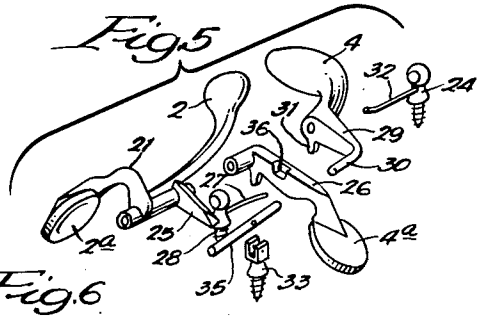
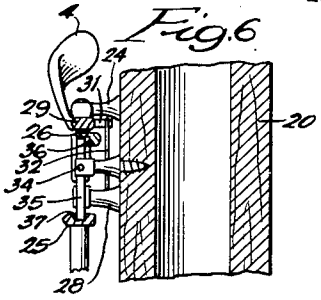


Fig. 6



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KEYING MECHANISM FOR CLARINETS

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2 Claims. (Cl. 84—382)

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This invention is directed to an improvement in the key mechanism for musical instruments of the woodwind type; it is particularly directed to a mechanical improvement in woodwind instruments constructed in accordance with the Boehm system. While my invention is especially useful for, and is illustrated in connection with, Boehm clarinets, it will be understood that the invention may be used also with various other types of woodwind instruments employing the Boehm system of keying.

The Boehm keying mechanism, developed about fifty years ago, has now replaced almost completely the older Albert clarinet construction. While the Boehm system represents great mechanical advancement over the Albert system, it still presents to the individual artist a serious problem in playing passages in which the little fingers of both hands come into play. In many musical passages it is necessary for the performer to execute rapid changes between the E flat-A flat key, which is key **4** in the appended drawing, and one or another of the B-E, C sharp-F sharp, or C-F keys, respectively denoted **1**, **3**, and **16** on the drawing.

Key **4** is normally operated with the little finger of the right hand, while keys **1**, **3**, and **16** of a Boehm instrument are actuated by the little finger of the left hand. When execution of rapid changes or alternations between key **4** and any of the other enumerated keys is required, the performer's little fingers are called upon to alternate movements very rapidly and with extraordinary precision. If such a passage is to be played properly, one little finger must be raised at the precise instant that its counterpart on the other hand is depressed. Even the most accomplished of performers find such passages awkward, and many players of first-rate professional ability never achieve the degree of muscle control necessary to play such passages with certainty.

The present invention is directed to an improvement of the Boehm system which permits a performer to execute rapid alternation between the E flat-A flat key and any of the B-E, C sharp-F sharp, or C-F keys without the necessity for precise coordinated movements of the little fingers. Achievement of that end is the primary object of my invention.

Stated more specifically, the major object of my invention may be described as providing in a Boehm-system instrument a modified construction by which the valve normally under the sole control of the E flat-A flat key can under certain circumstances also be controlled by any of the B-E, C sharp-F sharp, or C-F keys.

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A further object of my invention is to provide, in a Boehm-system instrument, a novel mechanical linkage which permits actuation of the E flat-A flat key to open its corresponding valve when operated alone in the usual fashion but which leaves said valve free to close responsively to actuation of any of certain other keys even while the E flat-A flat key remains depressed.

The manner in which I accomplish the foregoing and other objects of my invention will appear clearly from the appended drawing and the description thereof which follows.

In the drawing, I have, for illustrative purposes, shown one section of a clarinet constructed in accordance with the Boehm system, as modified according to my invention. Figure 1 shows the clarinet section in plan view; Fig. 2 is a fragmentary side elevation view showing in considerable detail the novel mechanical linkage which characterizes my invention; Fig. 3 is a sectional view taken along the lines **3**—**3** of Fig. 2; Fig. 4 is another sectional view, taken along the broken line **4**—**4** of Fig. 2; Fig. 5 is an exploded perspective view which brings out in great detail the construction of my invention; and Fig. 6 is a fragmentary view, partly in section, taken along the line **6**—**6** of Fig. 4.

Referring now to the drawing, it may be noted that I have shown a clarinet section **20** and have for convenience designated the keys thereof with reference numerals. The E flat-A flat key is denoted key **4**, and the valve which it operates is denoted **4***a*. Valve **4***a* is a normally closed valve, and in the conventional Boehm clarinet it is joined to key **4** by a rigid lever. In such a conventional instrument, therefore, valve **4***a* is always open whenever key **4** is depressed.

Valves **2***a* and **14***a* are normally open valves. Depression of either key **2** or key **16** will close valve **2***a* without affecting any of the other valves on the instrument. Actuation of either key **14** or key **1** will close valves **2***a* and **14***a*, leaving the other valves unaffected. Valve **15***a*, on the opposite side of the instrument from valves **2***a* and **14***a*, is a normally closed valve. Actuation of either key **3** or key **15** will open valve **15***a*, at the same time closing valve **2***a*.

All the foregoing operations are conventional in the Boehm-system clarinet and form no part of the present invention. The actuating mechanism for valve **2***a* consists of a rigid lever **21** having key **2** integrally formed therewith, lever **21** being provided with a fulcrum by being pivoted

on a rigid pin 22 extending between anchor posts 23 and 24. The shank portion of key 2 is provided with a pawl 25 extending therefrom at right angles on the opposite side of the instrument from valve 2a. The purpose in the conventional clarinet of pawl 25 is to cooperate with a cam 26a controlled by key 16, to cause key 2 to be depressed whenever key 16 is actuated. Pawl 25 performs that function in the clarinet of the present invention but it also performs an important additional function to be more fully described hereinafter.

In the present invention valve 4a is integrally joined to a lever member 26 which is also pivoted on pin 22. A spring 27 carried by a post 28 presses upwardly on the under side of lever 26 and causes valve 4a to be urged toward its open position.

Key 4 in my invention is integrally joined with a guide lever 29 having a pawl 30 projecting at right angles to the body of lever 29. Key 4 and its associated structure is pivoted onto pin 22 immediately behind lever 26, the parts being interrelated so that pawl 30 overlies lever 26. On the under side of lever 29 a small spring seat 31 is engaged by spring 32 carried on post 24. Spring 32, pressing against spring seat 31, causes key 4 to be urged normally upward and, correspondingly, causes pawl 30 to be urged downward. The force exerted by spring 32 is considerably greater than that exerted by spring 27, with the result that when key 4 is not being engaged by a performer's finger, the force of spring 32 overrides that of spring 27 and causes valve 4a to be closed.

When a performer's finger presses upon key 4, pawl 30 is of course raised and valve 4a immediately opens, responsively to the force of spring 27.

On the body of clarinet 20, between lever 26 and pawl 25, I have provided a post 33 provided with a bifurcated upper portion adapted to receive a small pin 34 which serves as a pivot or fulcrum for lever 35.

One end of lever 35 fits rather loosely within a recess 36 cut into the upper surface of member 26, while the other end is received within a recess 37 in pawl 25. Recess 37 is somewhat larger than the end of lever 35, so as to provide a limited degree of play for lever 35 therewithin. If desired, the end of lever 35 which cooperates with pawl 25 may be formed in the shape of a ball and recess 37 may be given a spherical inner surface. It will be understood, however, that such construction constitutes an optional refinement. Entirely successful operation is achieved merely by giving the top and bottom walls of recess 37 a slight taper so as to leave lever 35 a small amount of freedom to rotate in the vertical plane around pin 34 as a pivot.

The depth of recess 36 is so chosen that, when valve 4a is closed, the recess will permit lever 35 to move vertically to the extent required by actuation of key 2. Recess 36 is so proportioned that when valve 4a is closed, the end of lever 35 just touches the floor of recess 36 when key 2 has been fully depressed.

From the foregoing description of the structure of my invention, it will be seen that in my instrument valve 4a is normally closed and may be opened by manually depressing key 4, just as in a conventional Boehm instrument. Similarly, valve 2a is normally open and may be closed by manually depressing key 2, just as in the conventional instrument.

In an instrument embodying my invention, however, valve 4a does not necessarily remain open when key 4 is depressed, since manual actuation of key 2 or any of the other keys linked to key 2 will automatically close valve 4a even though key 4 remains in its depressed position. This action results from the operation of the lever 35. When key 4 has been depressed manually, spring 27 will open valve 4a, but when key 2 is depressed, pawl 25 rises and carries with it one end of lever 35. Lever 35 pivots on pin 34 and thus forces valve 4a into closed position against the opposition of spring 27. Valve 4a will thus remain in closed position so long as key 2 or any of its associated keys, that is keys 16, 1, 3, 14, or 15, remain depressed. Key 4 does not interfere in any way with this action of valve 4a, since pawl 30 lies above lever 26 and does not inhibit or interfere with the closing of valve 4a.

In using an instrument embodying my invention, a performer can execute rapid changes between key 4 and any of the keys 1, 3, or 16 merely by depressing key 4 with his right little finger, holding it depressed throughout the passage, and actuating the other key or keys in the conventional manner as the passage progresses. The automatic apparatus which characterizes my invention will cause valve 4a to be opened during the appropriate portions of the passage and to be closed at all times when the C-F key, herein denoted key 2, is closed. The closure of the valve 4a, normally associated with the E flat-A flat key, occurs at the same instant that the C-F key is depressed, exactly as it should be when a conventional instrument is played by a performer having extraordinary manual skill and dexterity in effecting the alternation with his little fingers.

A particular feature of my invention lies in the fact that my invention in no way interferes with the use of the instrument in the usual way.

While I have in this specification described for purposes of illustration a particular embodiment of my invention, as applied to a clarinet, it will be understood that numerous changes and modifications in the illustrated structure can be made by persons skilled in the art without departing from the spirit of my invention. It is accordingly my desire that the scope of the invention be determined primarily with reference to the appended claims.

I claim:

1. A Boehm-system woodwind instrument modified to provide a yieldable coupling between the E flat-A flat valve and its corresponding manual key, in combination with a pivoted C-F key having a pawl extending therefrom on the same side of the instrument as the E flat-A flat valve, said pawl defining therein a socket facing said valve, a pivot post mounted on said instrument between said E flat-A flat valve and said pawl, a lever pivoted thereon, one end of said lever being seated in said socket and the other end overlying said E flat-A flat valve and adapted to engage the same in closed position when said C-F key is manually actuated, said lever being raised out of engagement with said E flat-A flat valve in both the open and closed positions of said valve when said C-F key is not being manually actuated.

2. A Boehm-system woodwind instrument modified to provide an independently pivoted E flat-A flat valve, spring means for said valve urging the same toward its open position, an independently pivoted E flat-A flat key having a pawl overlying said E flat-A flat valve, spring means for said key normally urging said pawl against said valve to

hold it in closed position, said last-mentioned spring means being strong enough to override said first-mentioned spring means, manual actuation of said key being operative to raise said pawl and allow said valve to open under the force of said first spring means, a pivoted C-F key having a pawl extending therefrom on the same side of the instrument as said E flat-A flat valve, said last-mentioned pawl defining therein a socket facing said valve, a pivot post mounted on said instrument between said E flat-A flat valve and said last-mentioned pawl, a lever pivoted thereon, one end of said lever being seated in said socket and the other end overlying said E flat-A flat valve and adapted to engage the same in closed position when said C-F key is manually actuated, said

lever being raised out of engagement with said E flat-A flat valve in both the open and closed positions of said valve when said C-F key is not being manually actuated but causing said E flat-A flat valve to be closed at all times when said C-F key is being manually actuated, regardless of the position of said E flat-A flat key.

LEWIS F. SUTTER.

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The following references are of record in the file of this patent:

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Number	Name	Date
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