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KEY MECHANISM FOR MUSICAL INSTRUMENTS

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Fig 1

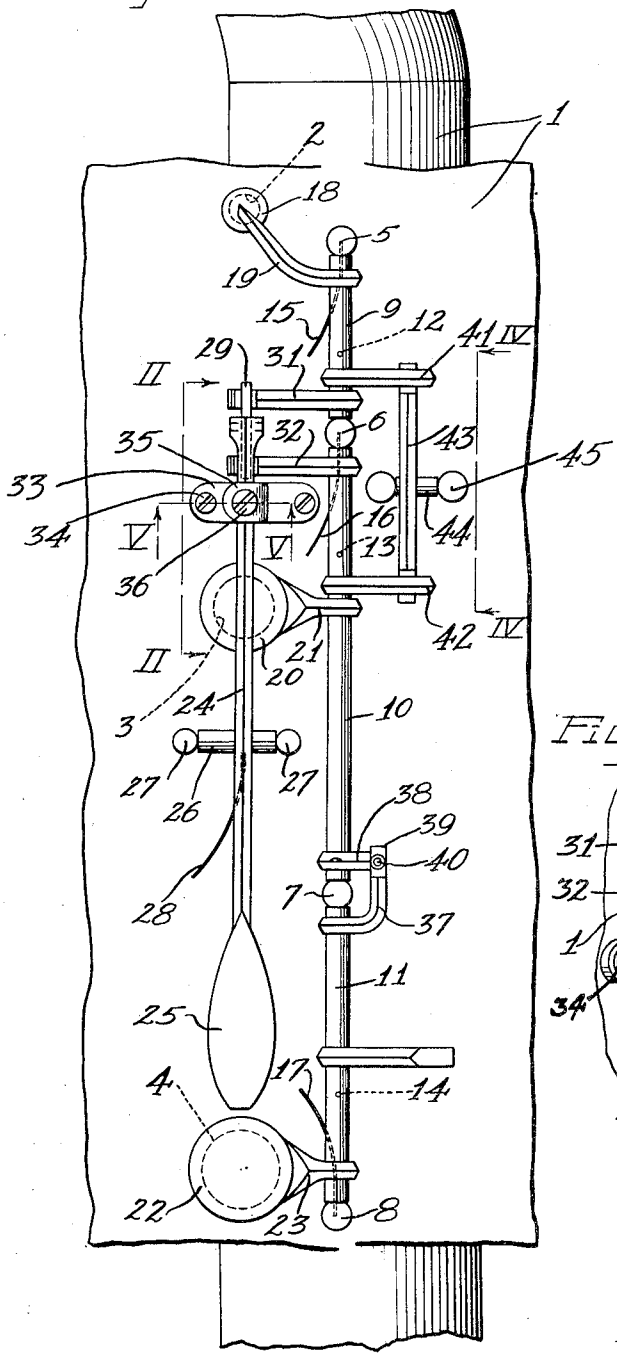


Fig 5

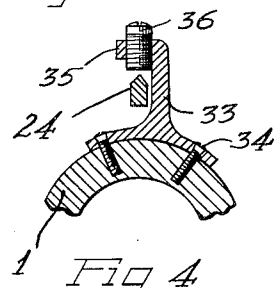


Fig 4

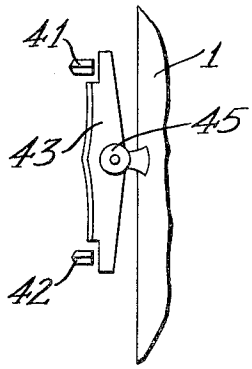


Fig 3

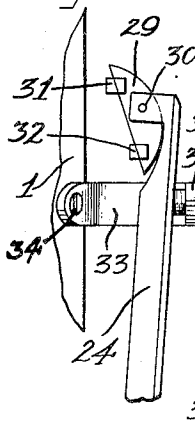
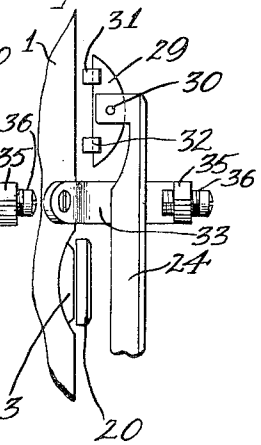


Fig 2



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KEY MECHANISM FOR MUSICAL INSTRUMENTS

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This invention relates to improvements in key mechanism for musical instruments, and more particularly to key mechanism or tone producing mechanism highly desirable for instruments of the woodwind variety, such as clarinets including alto and bass clarinets, saxophones, oboes, bassoons, etc., although the invention may have other uses and purposes in connection with musical instruments, as will be apparent to one skilled in the art.

In the past, extreme difficulty has been experienced in the provision of key mechanism for controlling certain tone holes near the upper portion of a tubular body of the instrument, just below the mouth piece or neck as the case may be. This difficulty resided in the provision of key mechanism desirably facile in action, positive in their control of tone hole pads and the like, and the parts of which are so instantaneous in action that only the true and desired tone results. For example, in frequent mechanisms for this general purpose provided in the past, the register hole of a clarinet would be open for a fraction of a second with the true B flat tone hole, thus causing a short but none the less highly objectionable false tone or burble when the musician changed from one tone to another, and especially so during rapid playing of the instrument. At the same time, of course, while instantaneous and positive action of all parts of the key mechanism is desired, the mechanism must be simple in construction, easy to install, readily manipulated by the musician, and at the same time be more durable than mechanisms of this character heretofore provided.

With the foregoing in mind, it is an important object of the instant invention to provide simple, highly effective key mechanism capable of withstanding relative rough handling of the instrument.

Another object of the invention is the provision of key mechanism of the character set forth herein, which effectively compensates automatically for uneven swelling of tone hole pads.

Still another object is the provision of key mechanism for woodwind instruments which eliminates fine and delicate adjustments, which obviously are relatively short lived, of a character heretofore found necessary.

A further and very important object of the instant invention is the provision of key mechanism for woodwind instruments so arranged that it effectively eliminates burble or momentary false tone effects caused by one unwanted tone hole opening or remaining open a fraction of a second along with the opening of a desired tone hole.

It is also a feature of this invention to provide a key mechanism for woodwind instruments which is instantaneously and positive in its action so that an undesired tone hole will not be opened or left opened by a fraction of a second when changing from one tone to the other, even during rapid play of the instrument.

Another important object of this invention resides in the provision of a key mechanism for woodwind instruments and the like which is highly simplified in construction, without the sacrifice of accuracy in operation, and permits the elimination of certain fixed and pivoted parts

heretofore found necessary. In other words, the instant invention requires less parts than were required formerly, and yet adds to the accuracy of the result.

Another feature of the invention is the provision of accurately and facile operated key mechanism of the character set forth herein, with which may be associated safety means, so that if certain parts become damaged due to rough handling, the safety means may be relied upon to carry on with the function of the damaged parts.

It is also a feature of the invention to provide key mechanism for a woodwind instrument arranged to provide ease of assembly and mounting on the instrument, and which effectively eliminates levers, pivot members, and the like, disposed beneath hinge rods.

It is also an object of the invention to provide key mechanism for woodwind instruments embodying connections whereby automatic control of a tone hole pad is effected through suitable leverage or linkage means from one hinge pin to the next adjacent hinge pin carrying the particular pad, whereby the mechanism is instantaneous in action and operable positively through relatively short distances.

Still a further feature of the invention is the provision of a key mechanism which, with relatively little if any adjustment or variance in structure, may be utilized on various instruments of the woodwind class, such as saxaphones, oboes, bassoons, clarinets of various types, etc. and which may effective be used on such instruments where a resonance key controlled hole operates with a regular tone hole.

While some of the more salient features, characteristics and advantages of the instant invention have been above pointed out, other will become apparent from the following disclosures, taken in conjunction with the accompanying drawing, in which—

Figure 1 is a fragmentary elevational view of key mechanism embodying principles of the instant invention installed on the upper part of the body of an alto or bass clarinet, with a portion of the clarinet body resolved into the flat for better illustrative purposes;

Figure 2 is a fragmentary side elevational view of a portion of the structure shown in Fig. 1, taken substantially as indicated by the line II—II of Fig. 1;

Figure 3 is a fragmentary enlargement of the upper portion of Fig. 2, showing the same in a different position of operation;

Figure 4 is a fragmentary side elevational view of a portion of the structure, taken substantially as indicated by the line IV—IV of Fig. 1; and

Figure 5 is a fragmentary transverse vertical sectional view taken substantially as indicated by the line V—V of Fig. 1.

As shown on the drawings:

For illustrative purposes, but not by way of limitation, the instant invention will be explained in association with a bass clarinet. Such a clarinet includes a body portion which may be made of one or two pieces of material, and which body portion carries all the key mechanism, a bell at the lower end of the body portion, and a curvate neck connected to the upper end of the body portion, which neck carries the mouth piece and reeds.

In the apparatus selected for illustrative purposes, there is shown the upper portion of the body 1 of a bass clarinet. This body 1 may be made of any suitable material, such as wood, thermosetting plastic, or other material capable of giving good tone. The section of the body shown in the drawing is provided with three tone holes, including a register hole 2, sometimes referred to as the octave hole or the twelfth hole, depending upon the particular instrument, a B flat hole 3 capable of alone producing a true B flat tone when opened in conjunction with the customary A hole not illustrated, and an F

sharp or thumb hole 4. The mechanism about to be described effects a simple and facile control over the opening and closing of these three tone holes.

With reference to Fig. 1, it will be seen that the apparatus includes a series of aligned fixed posts 5, 6, 7 and 8. Between each pair of posts is a hinge rod rotatable in either direction relatively to the respective pair of posts between which it is mounted. These include an upper hinge rod 9, an intermediate hinge rod 10, and a lower hinge rod 11. On the underside thereof each hinge rod carries an inwardly extending pin, designated 12, 13 and 14, respectively. A needle spring 15, shown in release position for purposes of clarity, engages behind the pin 12 on the upper hinge rod and constantly urges this hinge rod clockwise as illustrated in the drawings. A needle spring 16 engages the pin 13 on the intermediate hinge rod and constantly urges this hinge rod clockwise as illustrated. The same is true of a third needle spring 17 which engages the pin 14 and constantly urges the lower hinge rod 11 in a clockwise direction, as illustrated. As is seen clearly in Fig. 1, the three hinge rods are preferably in axial alignment.

A tone hole cover 18, which may be in the form of the customary cup carrying a soft pad of felt or cork on its underside overlies the register hole 2 and is rigidly connected with the upper hinge rod 9 by an arm 19. Similarly, a cover 20 overlies the B flat hole 3 and is rigidly connected to the intermediate hinge rod 10 by an arm 21. Both the covers 18 and 20 are normally in closed position by virtue of means later to be described, but are constantly urged toward open position by the needle springs 15 and 16, respectively.

Another tone hole cover or pad cup 22 overlies the F sharp hole 4 and is rigidly connected to the lower hinge rod 11 by an arm 23. This cover 22 is normally in open position, and is constantly urged toward open position by the needle spring 17, each of the needle springs having one end anchored to its respective post 5, 6 or 8.

Disposed to one side of the alinged hinge rods, is an elongated key 24 having a spatulate end 25. This key is intermediately pivoted on a transverse pivot rod 26 mounted between suitable fixed posts 27. A flat spring 28, diagrammatically illustrated, constantly urges the spatulate end 25 outwardly away from the body 1, and this spring 28 is stronger than any of the needle springs above mentioned, and stronger than the combined strength of needle springs 15 and 16. As seen in Fig. 2, the key 24 is in spaced relationship to the B flat hole cover 20 so that it does not contact the cover 20 at any time.

The end of the key 24 opposite the spatula 25 has a rocker 29 freely pivoted on a cross pin 30. This rocker overlies the adjacent ends of an arm 31 fixed to the upper hinge rod 9, and an arm 32 fixed to the intermediate hinge rod 10. The rocker 29 evenly distributes the pressure of flat spring 28 between the arms 31 and 32 and thus automatically coordinates that pressure so as to maintain tone hole covers 18 and 20 in closed position regardless of rough handling of the instrument, and regardless of uneven swelling of the pads carried by these covers, which uneven swelling on occasion would cause the arms 31 and 32 to assume an unparallel relationship. With the aid of the rocker 29, however, any uneven swelling of the cover pads is automatically compensated for and the covers 18 and 20 remain tightly closed as long as no pressure is exerted on the spatula 25.

Stop means are provided to limit the upward movement of the upper end of the elongated key 24, so that this end of the key will not rise too high to take the rocker 29 out of contact with either of the arms 31 or 32. As seen best in Figs. 1 and 5, these stop means comprise an upstanding holder 33 having its base portion secured to the body 1 by screws or other means as indicated at 34, this holder having a laterally extending head 35 thereon through which a set screw 36 is adjustable. The set screw 36 overlies the end of the elongated key 24, and may be adjusted in an obvious manner to limit upward movement of that end of the key. Thus, as is evident from the showings in Figs. 2 and 3, the rocker 29 is always in contact with the arms 31 and 32.

In order to effect a control of the B flat hole pad 20 under certain conditions of operation from the lower hinge rod 11, there is an angular arm 37 fixed to the lower hinge rod. The free end of this arm 37 underlies the free end of an arm 38 fixed to the intermediate hinge rod 10. This arm 38 carries a head 39 on its end in which is a set screw 40 adjustable to a desired degree to establish contact when desired with the free end of angular arm 37. When the parts are in normal position, the arm 37 will be spaced away from the set screw 40 by virtue of the action of needle spring 17, and the action of leaf spring 28.

In operation the instant invention is extremely simple and effective. When the thumb cover 22 is pressed into closed position over the F sharp hole 4 against the action of needle spring 17, the F sharp hole is of course closed, and the covers 18 and 20 on the register and B flat holes remain closed by virtue of the leaf spring 28 urging the rocker 29 against the arms 31 and 32, overcoming needle springs 15 and 16.

When the spatula 25 alone is pressed by the thumb of the operator, overcoming the action of leaf spring 28, the cover 20 is raised off the B flat hole, the cover 22 over the F sharp hole remaining in its normally open position, and the cover 18 and the register hole staying closed. The cover 118 is maintained in closed position by virtue of the needle spring 16 overcoming the action of needle spring 15 through arm 32, the rocker 29, and arm 31, as seen in Fig. 3. It will be seen, therefore, that the hinge rod 9 is maintained in desired position by virtue of a spring acting upon the immediately adjacent hinge rod 10, which is through a relatively short distance, and which effects instantaneous control over hinge rod 9 through rocker 29. The importance of this arrangement is at once apparent, when it is considered that with key mechanism heretofore utilized, there frequently was an interval when changing from a B flat tone to another tone when the register hole 2 would be temporarily uncovered along with the B flat hole. Now while that temporary interval when both holes were open might be for only a fraction of a second, nevertheless it created a very objectionable false tone or burble at the start of playing the next desired note or tone. The instant mechanism completely and effectively eliminates any such burble. It will be noted that when the spatula 25 is pressed to open the B flat cover 20, the needle spring 16 has moved the rocker 29 to the position seen in Fig. 3, exerting instantaneous control over the arm 31 and the hinge rod 9 so that the cover 18 of the register hole is not permitted to open even for a fraction of a second, and a true solid B flat tone alone is produced. It will be further noted that the rocker 29 also effectively compensates for unequal swelling of the pads carried by the tone hole covers 18 and 20.

When the thumb of the operator mutually engages the cover 22 and the spatula 25 so as to press both of them, obviously the F sharp tone hole 4 is closed, the B flat hole is closed by the cover 20 through the medium of arm 37 elevating the free end of arm 38 on the intermediate hinge rod 10 which also overcomes the action of needle spring 16, permitting needle spring 15 to elevate cover 18 over the register hole, rocker 29 assuming a pistion tipped in the opposite direction from the showing in Fig. 3. It will be seen that here again control is exercised from one hinge rod over the immediately adjacent hinge rod through the medium of arms 37 and 38.

While the foregoing mechanism is all that is necessary, it may be deemed desirable at times, especially where the musician does a lot of traveling and his instrument is subject to rough handling, to provide additional safety levers to compensate for breakage or maladjustment of parts adjacent the rocker 29, such as the stop element 33. To this

end I have illustrated a pair of normally parallel arms **41** and **42** extending to the opposite side of the hinge rods **9** and **10**, respectively, these arms being secured at one end to the respective hinge rods. The outer or free ends of the arms overlie a rocker **43** carried centrally thereof on a pivot pin **44** between a pair of posts **45** secured to the body **1**. Should anything happen to adversely affect the operation of the rocker **29**, needle spring **16** may still prevail over needle spring **15** by causing arm **42** to bear down on one end of the rocker **43** and thus bring the other end into holding contact against arm **41** so that hinge rod **9** cannot turn, and the register hole cover **18** will remain in closed position.

From the foregoing, it is apparent that I have provided highly simplified and positively acting key mechanism for a woodwind instrument or the like, which mechanism eliminates many parts heretofore found necessary, and which effectively prevents two tone holes being open unintentionally even for a slight fraction of a second. The instant mechanism also eliminates what may be termed extremely fine and delicate adjustments likely to become out of order even during play, and also eliminates the use of pivotal members crowded into position beneath the hinge rods, where access is difficult for necessary repairs when some damage is done. Further, the instant mechanism leaves ample room for the provision of an added safety linkage, as above explained in connection with arms **41** and **42** and rocker **43**, if the same is deemed desirable by the prospective purchaser. The invention is highly economical to construct, possesses long life, and considering its character is highly durable.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. Key mechanism for woodwind instruments and the like, said mechanism being mounted on the body of the instrument and comprising resiliently urged movable means, spaced tone hole covers separately operable and carried by said means, a control element projecting from said means for each tone hole cover, a key pivotally mounted adjacent said means, spring means urging one end of said key away from the instrument body, a rocker pivoted centrally thereof to the other end of said key and overlying said control elements in constant contact with both said control elements by virtue of said spring means, safety means associated with said movable means ineffective while said rocker is operable but effective if said rocker is unable to maintain contact with said control elements to preclude the opening of more than one of said tone hole covers at a time, said safety means including a centrally pivoted rocker on the other side of said resiliently urged means from the first said rocker, and a control element projecting from said resiliently urged means for each tone hole cover and overlying an end of the last said rocker in contactable position therewith.

2. Burble eliminating key mechanism for a musical wind instrument having a body with tone holes therein and tone hole covers for a pair of said holes actuated by means connected separately to a pair of spring biased hinge rods, said mechanism being mounted on the body of the instrument and including a pair of arms projecting in parallel relationship one from each said hinge rods, a key pivotally mounted intermediate the ends thereof, spring means constantly urging one end of said key outwardly from the instrument body and the other end toward the instrument body, a rocker element centrally pivoted to said other end of said key and having a straight edge portion overlying and bearing simultaneously upon the ends of both said parallel arms with the plane of the pivot intermediate the bearing points, and said spring means insuring constant contact of said rocker element with both said arms, whereby when the free end of said key is pressed inwardly against the action of said spring means and a hinge rod moved to elevate one only of the tone hole covers the corresponding arm moves with the hinge rod and holds the other tone hole cover closed through said rocker element and when a change is made from one tone to another said rocker element prevents a temporary and undesirable opening of the other tone hole cover by virtue of the constant pressure contact between said rocker element and both said arms.

3. Burble eliminating key mechanism for a musical wind instrument having a body with tone holes therein and tone hole covers for a pair of said holes actuated by means connected separately to a pair of spring biased hinge rods, said mechanism being mounted on the body of the instrument and including a pair of arms projecting in parallel relationship one from each said hinge rods, a key pivotally mounted intermediate the ends thereof, spring means constantly urging one end of said key outwardly from the instrument body and the other end toward the instrument body, a rocker element centrally pivoted to said other end of said key and having a straight edge portion overlying and bearing simultaneously upon the ends of both said parallel arms with the plane of the pivot intermediate the bearing points, and said spring means insuring constant contact of said rocker element with both said arms, whereby when the free end of said key is pressed inwardly against the action of said spring means and a hinge rod moved to elevate one only of the tone hole covers the corresponding arm moves with the hinge rod and holds the other tone hole cover closed through said rocker element and when a change is made from one tone to another said rocker element prevents a temporary and undesirable opening of the other tone hole cover by virtue of the constant pressure contact between said rocker element and both said arms.

4. Burble eliminating key mechanism for a musical wind instrument having a body with tone holes therein and tone hole covers for a pair of said holes actuated by means connected separately to a pair of spring biased hinge rods, said mechanism being mounted on the body of the instrument and including a pair of arms projecting in parallel relationship one from each said hinge rods, a key pivotally mounted intermediate the ends thereof, spring means constantly urging one end of said key outwardly from the instrument body and the other end toward the instrument body, a rocker element centrally pivoted to said other end of said key and having a straight edge portion overlying and bearing simultaneously upon the ends of both said parallel arms with the plane of the pivot intermediate the bearing points, said spring means insuring constant contact of said rocker element with both said arms, whereby when the free end of said key is pressed inwardly against the action of said spring means and a hinge rod moved to elevate one only of the tone hole covers the corresponding arm moves with the hinge rod and holds the other tone hole cover closed through said rocker element and when a change is made from one tone to another said rocker element prevents a temporary and undesirable opening of the other tone hole cover by virtue of the constant pressure contact between said rocker element and both said arms, and stop means limiting movement of the key end carrying said rocker element away from the instrument body to maintain constant contact of the rocker element with both said arms.

References Cited in the file of this patent

UNITED STATES PATENTS

Re. 23,725	Leblanc	Oct. 20, 1953
2,151,337	Selmer	Mar. 21, 1939
2,633,048	Sutter	Mar. 31, 1953

FOREIGN PATENTS

372,036	France	Feb. 8, 1907