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CLARINET

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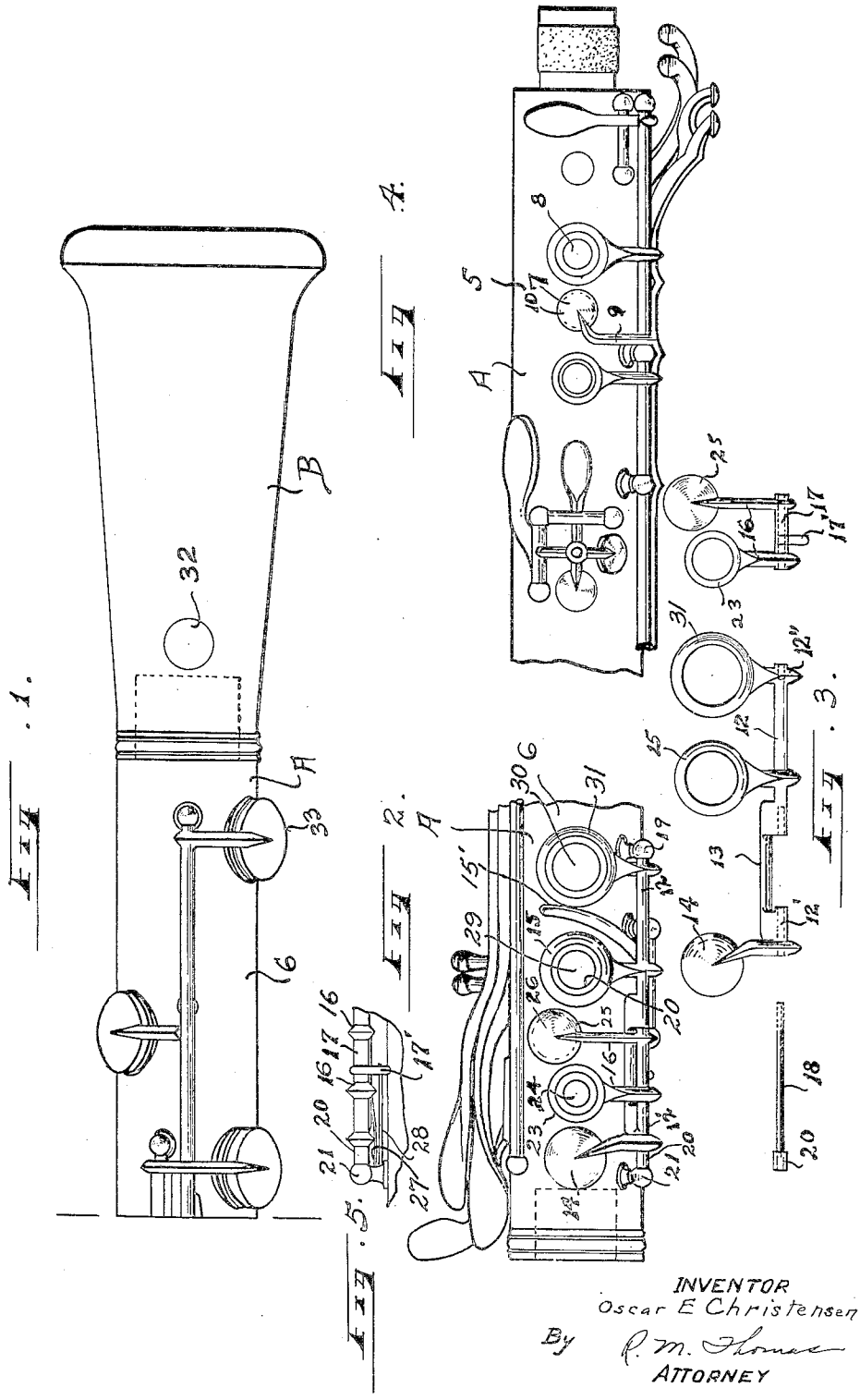


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## CLARINET

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4 Claims. (Cl. 84—382)

1

This invention relates generally to improvements in clarinets and pertains particularly to the Boehm system clarinet.

An object of the present invention is to provide in a Boehm system clarinet, certain modified features or modifications of the structure whereby may be produced a better intonation in the playing of certain tones which are faulty in the conventional models.

Another object of the invention is to provide, in a Boehm system clarinet, an improved tone hole and key construction and arrangement whereby the tones "B," "F" sharp and "E" flat, may be played in correct tune with normal lip pressure.

Still another object of the invention is to provide in a Boehm system clarinet, a novel means for effecting correct tuning of the tones "B," middle line of the staff, and the lowermost tone of "E," by the employment of an added pitch control tone hole in the instrument bell.

Still another object of the invention is to provide in a Boehm system clarinet a modifled and improved construction whereby correct intonation is obtained of the tones "E" flat and "E," lower line of the staff, and "B" flat and "B," second space above the staff.

The invention will be best understood from a consideration of the following detailed description of the new key and tone hole arrangement, taken in connection with the accompanying drawing, with the understanding that the invention is not to be considered as limited by the specific illustration or description but that such illustration and description constitute a preferred embodiment of the invention.

In the drawings:

Figure 1 is a view of the lower section of a clarinet and the bell, illustrating the location of a new tone hole constituting a feature of the present invention.

Figure 2 is a view of a portion of the middle section of a clarinet illustrating a feature of my improvement thereon.

Figure 3 is an exploded view of the parts which make up the assembly as shown in Figure 2.

Figure 4 is a view of a portion of the upper section of the clarinet illustrating another feature of my improvements therein.

Figure 5 is a fragmentary detail showing particularly the arrangement of the control spring for the modified ring and added tone hole pad.

The present conventional models of Boehm system clarinets require modifications in lip, or embouchure pressure when playing certain tones in order that they may be played in proper tune

2

or pitch. This adds to the difficulties of the performer and, naturally, lowers the quality of his performance. The degree of modification among these faulty tones varies; some require a tightening of the pressure, while others demand a relaxation. For example, let me cite the tones "B" second space below staff, and "E" flat, third line above staff, particularly when these tones are produced according to one of the three different fingering positions which may be used by closing the center ring tone hole of the lower or right hand ring assembly. "F" sharp, top line of staff, is also produced with this fingering. Should this "B," "F" sharp and "E" flat tone hole be so arranged that the tone "F" sharp would be in correct pitch, or tune, when produced with the above stated fingering, and with normal lip pressure, then the tone "B" would be very sharp and the tone "E" flat would be very flat. To raise the pitch of this "E" flat tone fingering charts advise the opening of regular key #4 (not shown) with this fingering. Even with this assistance the tone is still very flat in pitch unless considerable extra lip pressure is also used. The fingering that employes the cross key, #5, for producing these tones is similarly faulty, but, however, to a lesser degree.

The tones "E," fourth space below staff, and "B," middle line of staff, are likewise faulty. The twelfth interval between these tones is much too long, making the correct tuning of both tones impossible. These tones could be correctly tuned by a relocation of the 12th or octave key vent, but this would have a bad effect on the intonation among tones of the upper section.

The tones "E" flat, lower line of staff, and "B" flat, second space above staff, when produced by the fingering employing the index fingers of each hand are similarly affected. Should the "B" flat be correctly tuned, the "E" flat would be exteremely sharp, and vice versa.

The tones "B," second space below the staff, "F" sharp, top line of staff, and "E" flat, third line above the staff, are all produced by employing the same finger position in the ring assembly of the lower or right hand section of the Boehm clarinet. Three different finger positions are available for this purpose;

1. By closing the upper ring tone hole with the index, or first, finger of the right hand and depressing the cross key 15′ with the third finger of the right hand simultaneously to open a tone hole not shown in the drawing.

2. By closing the center ring tone hole with second finger of the right hand.

3. By closing lower ring tone hole with the third finger of the right hand.

Many players use the third mentioned fingering in preference to the second when playing "E" flat because of better intonation. The present invention corrects the faulty intonation of the second mentioned fingering.

By greatly reducing the size of the tone hole covered by first finger of right hand and adding a new tone hole adjacent thereto which is considerably larger in size and is covered by a padded key which is pivotally connected to the first ring assembly, and which is opened and closed simultaneously with first finger tone hole, a means is provided for correction of the faulty intonation in relation to the tones "B," "F" sharp, and "E" flat, when produced by closing the center ring tone hole, whereby they may be played in correct pitch or tune with normal lip pressure.

By placing a new tone hole approximately 1⅜ inches below the lowermost tone hole of the conventional "B" flat models, a means is provided for correct tuning of the tones "B," middle line of staff, and the lowermost tone of "E." This new tone hole could be better understood perhaps, by designating it as a pitch-controlling tone hole as its function is for this purpose exclusively. It is free of key or ring connection. The exact location and size of this pitch-controlling tone hole depends upon the size of the bore of the clarinet from the regular lowermost tone hole to the end of the bell. In conjunction with the standard size conventional bell end this pitch-controlling tone hole will be of rather small size. However, by enlarging this tone hole to a size comparable to the hole under lowermost key, a bell section of much smaller size may be employed. The clarinet may be so constructed that this pitch-controlling tone hole may be placed in the bell section or the lower main section, and instead of the single hole, two or more could be placed at corresponding points around the clarinet, small in size, of course, in accordance with number used. But for all practical purposes the single hole should be best.

The above description of this pitch-controlling tone hole is in relation to all Boehm system models except the full Boehm with low "E" flat tone hole. For this model the same principle applies. It would simply be placed below the lowermost tone hole for correct tuning of the tones "B" flat, middle line of staff, and low "E" flat when both tones are produced with the low "E" flat key.

This pitch controlling tone hole also permits of placing the 12th or octave register vent hole at a point where correct intonation may be had among the tones of the upper main section of the clarinet.

The tone holes associated with the upper main section ring and padded key assembly which is manipulated by second finger of left hand are altered in size for a similar reason. The ring hole is reduced in size and the padded key hole is enlarged. This means provides correct intonation of tones associated herewith, namely, "E" flat and "E," lower line of staff, and "B" flat and "B," second space above staff. Reduction in size of this ring tone hole has a good effect upon the tone "D," first space below staff. The inclination to sharpness of this tone, as on the conventional model, disappears.

In tuning the scale of a clarinet in relation to a fixed pitch such as "A 440," which is the standard pitch in use today, the location on the barrel, or body, of the instrument of the various tone



holes in respect to their size and distance from point of tone inception (the reed) is an important factor. There is a definite point on the barrel, or body, of a clarinet wherefrom a tone in the lower register and the tone a 12th above may both be produced in correct tune without fluctuation in lip or embouchure pressure. Whereas, should the tone hole be placed short of, or beyond this point, the production of these tones in correct tune without lip pressure fluctuation would not be possible. Should the tone hole be placed just slightly short of this point and the lower register tone be correctly tuned the 12th above would be too flat. If placed beyond this point the reverse would result.

This condition is very noticeable in the tones "E" flat, lower line of staff, and "B" flat, second space above staff, when they are produced by the Boehm or "one and one" fingering, which requires the index finger of each hand to close its respective tone hole. If the "E" flat is correctly tuned the "B" flat, 12th above, will be too flat and vice versa. The tone hole (second finger of left hand) is placed too short of point for correct intonation of both tones with this fingering. By reducing the size of this tone hole to that of "E" flat—"B" flat side key #7 or cross key #7 tone hole, these tones may be produced in correct pitch by closing the padded key, in line with and adjacent thereto, with index finger of left hand. By connecting key arm to upper end of oscillating shaft and extending in curved line to proper position above tone hole this key arm or padded key may easily be manipulated by the said left hand index finger. By this change the mechanical bridge connection between upper and lower sections may be dispensed with, thereby reducing cost of manufacture.

A similar condition exists in relation to the lower section "B"–"F" sharp-"E" flat tone hole in connection with the fingering for these tones that makes use of second right hand finger closing its respective tone hole. This tone hole is much too short of "true pitch" point. However, by using two tone holes placed so that one is short of and the other beyond "true pitch" point and having the one beyond "point" considerably larger in size to that of one short of "point" a balance is attained that produces these tones in true pitch or tune.

The new tone hole for correct tuning or lowermost "E" and "B," middle line of staff, when placed at "true pitch" point also attains a balance for producing these tones in correct tune.

For determining the proper positioning and to illustrate the proper sizes for the new and modified tone holes for carrying out the present invention, with reference to an instrument of the particular dimensions hereinafter set forth, the following dimensions may be employed.

The approximate position of the nodal point for each of the tone holes in the right hand ring assembly of the present invention and the approximate diameter of said tone holes on a clarinet with a cylindrical bore of .585 inch diameter at this point is as follows.

For the upper padded key 14 of assembly the nodal point is $10\frac{15}{32}$'' from the top of the tuning barrel. The diameter of the tone hole is .737 cm.

Tone holes 24 and 26, since both of these are employed simultaneously in tone production, the nodal point is located between them at approximately $11\frac{23}{32}$'' from the top of the tuning barrel. The diameter of hole 24 is .533 cm. and hole 26 is .919 cm.

The "B" flat-"F" tone hole under the center ring is at a nodal point $12\frac{31}{32}$'' from the top of the tuning barrel. The diameter of this hole is .955 cm.

The "A"-"E" tone hole (lower ring) nodal point is $13\frac{15}{32}$'' from the top of the tuning barrel and the diameter of the hole is 1.019 cm.

With the stated tone holes of the present invention arranged according to the above specifications, all tones produced therefrom will be of satisfactory intonation.

The tapered part of the clarinet bore of the present invention begins at approximately $16\frac{1}{2}$'' from top of tuning barrel and increases to .875'' diameter at 20'' from the top of the tuning barrel. The taper of the bell end will vary according to the length of the barrel. No one specific size is required in all cases.

The attainment of the several improved features above described is brought about by the following described physical alterations of parts of the clarinet body as illustrated in the drawing where such body is designated A and the bell portion is designated B. The upper and lower sections of the body A are respectively designated 5 and 6.

No showing is made of the balance of the clarinet as the invention resides entirely in these portions.

Figure 1, section B, illustrates new tone hole 32 placed below the lowermost key 33 as a means for correct tuning of tones that are produced with fingering employing lowermost key 33, namely "E" fourth space below staff

and "B" middle line of staff

The portion illustrated is that of a 17 key 6 ring model. In connection with full Boehm model, the tones involved would be "E flat" and "B flat"

A new dimension bell B is shown in this illustration and consists of a smaller bell, having a smaller bore or reduced taper and this structure works in conjunction with the new tone hole 32 for correct tuning as set out above.

In the lower section 6 of the clarinet the present invention involves new mechanical structure which consists of an offset or U-shaped portion 13, attached to shaft 12, near the end 12' thereof, and in which space the dual ring and key pad assembly 16 is mounted. The dual ring and key pad assembly 16 is employed in connection with the tone holes 24 and 26, respectively, said tone holes being those heretofore referred to in relation to the "true pitch" point, tone hole 24 placed short of and tone hole 26 placed beyond said true pitch point and tone hole 26 being much larger in size than tone hole 24.

The improvement in this section 6 of the clarinet provides an independently operative key



assembly to work in conjunction with the two tone holes that are provided in place of the single tone hole as in the conventional models, thereby correcting the faulty intonation that exists in this section.

The shaft 12 has the U-shaped portion 13 formed therein near the end 12' between the key pad 14 and the ring 15, and the dual ring and key pad assembly 16 is mounted in the space between the legs of the U-shaped portion. The base or shaft 17 of this assembly 16 is formed tubular and a mounting shaft or pivot rod 18 is passed in through the end 12' of the shaft 12, through the tubular shaft 17 and into opposite leg of the U-shaped portion 13. The end 12'' of the shaft 12 is bored to receive a pivot screw which is inserted through the post 19, and the pivot rod 18 has an enlarged head 20 which is also bored to receive a pivot screw inserted through the post 21, thus mounting the entire assembly upon the section 6. When ring 23 is depressed by index finger of right hand, the arm which connects ring 23 to shaft 17 makes contact with top side of U-shaped portion 13 thereby actuating movement of the entire three ring assembly. When not depressed by the finger the ring and key assembly 16 is kept in normally open position by spring 27.

In the ring and padded key assembly 16, the ring 23 covers or surrounds a smaller tone hole 24 and the padded key 25 covers the new tone hole shown in dotted lines as 26, which tone hole is offset from the line of the tone holes. By this assembly the tones "B," "F" sharp and "E" flat may all be played in correct tone or pitch. Springs 27 and 28 control the key assembly 16 and the key assembly mounted on the base or shaft 12, respectively. The hole 29 under the ring 15 and the hole 30 under the ring 31 are increased in size over the conventional model. A bumper arm 17' is provided on the shaft 17 to limit the movement of the ring and key assembly.

It will be obvious that the particular type of mounting of this assembly might be modified if desired by forming the bar 12 hollow from end to end and extending a pivot shaft completely through the bar 12, supporting it in the posts 19 and 21 without departing from the spirit of this invention.

In the upper section 5 the improvements which I have made for intonation correction, are set out heretofore, in which the tone holes 7 and 8 are altered in size from those of the conventional models of clarinets, with the hole 8 greatly reduced in size and with the tone hole 7 greatly increased in size over the usual like holes in the Boehm clarinet.

The arm 9 which operates pad key 10 is formed with a curved portion so that key 10 may be manipulated by the index finger of the left hand.

Having thus described my invention I claim:

1. In a clarinet of the Boehm type having a lower three ring tone hole assembly, means by which the tones "B" second space above the staff, "E" flat, third line above the staff and "F" sharp top line of the staff may be played in correct pitch, comprising a first ring tone hole of a size smaller than in a standard instrument, an added tone hole adjacent to the smaller first ring tone hole, a ring for the first ring tone hole, a pad for the added tone hole, the last named ring and pad being coupled together for movement as a unit whereby depression of the ring will move the pad to close the added tone hole, pivotally mounted rings for the other two ring tone holes,

said other two ring tone holes being of increased size, and a pivotal mounting for the coupled ring and pad by which the rings for the said other two ring tone holes are depressed with the depression of the coupled ring and pad and by which they may be depressed independently of and without moving the coupled ring and pad.

2. In a clarinet of the Boehm type having a lower three ring tone hole assembly, for playing the tones "B" second space below the staff, "E" flat third line above the staff and "F" sharp top line of the staff, means by which said tones may each be played in correct pitch by the usual fingering comprising a new first ring tone hole in place of and of smaller size than the first ring tone hole in a standard intrument, the remaining two ring tone holes being of increased size, a second new tone hole disposed on a line passing between the new first ring tone hole and the second ring tone hole, a shaft oscillatably supported adjacent to the three ring tone holes, rings secured to the shaft and disposed in operative relation to the second and third holes, a ring for the new first ring tone hole, a pad for the second new tone hole, means joining the pad and last named ring together, and means pivotally coupling the joined ring and pad with the shaft for oscillation as a unit on the axis of the shaft whereby the shaft may be oscillated independently of the joined ring and pad and initial oscillation of the joined ring and pad will effect oscillation of the shaft.

3. Means of the character described in claim 2



wherein the said shaft is formed with a parallel offset portion intermediate its ends, the connection of the offset portion in the shaft forming spaced shoulders, the said means joining the pad and the last named ring together being in the form of a pivot sleeve and of a length to position snugly between said shoulders, said shoulders having bores formed therein on the axis of the shaft, and a pivot pin extending through the bores of the shoulders and through the sleeve.

4. Means of a character stated in claim 2, wherein the said new first ring tone hole is positioned short of the true pitch point and the said second new tone hole is placed beyond said true pitch point, and the second and third ring tone holes are of increased size over the tone holes of the standard or conventional instrument.

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