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OCTAVE VENT FOR MUSICAL WIND INSTRUMENTS

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Figures 1, 1A, 2, 3, 4

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The invention relates to wind instruments and, more particularly, to such instruments of the type having an octave vent, for example, clarinets, oboes, saxophones, bassoons. It is known that the emission of notes obtained by the use of the key-controlled octave vent is relatively difficult, particularly in the twelfths. Moreover, the notes issued leave much to be desired, particularly with regard to quality, timbre, difficulty in holding them, fullness and balance of sound, and evenness of the tones emitted.

The present invention has for its object to obviate these objections and resides in providing a resonance space or chamber around the vent tube. Most simply, this resonance space is derived by providing a tubular cap or body having an end wall which engages the vent tube at the outer end thereof and having a tubular part spaced from the outer periphery of the vent tube and opening freely in the bore of the instrument.

Experience shows that the combination of the resonance chamber with the vent tube gives surprising results both from the point of view of the facility of the emission of the notes and with regard to the musical character thereof, for example: the timbre, purity and intensity of the said notes throughout this instrument and the absence of sharpening of the notes. Also, this chamber has been found to eliminate the hissing noises frequently produced with the ordinary octave vents.

In the accompanying drawing, there are shown by way of example which, however, are not limitative, two forms or embodiments of the invention. In this drawing:

- Fig. 1 is a longitudinal view of part of a clarinet in the region of the octave vent tube;
- Fig. 1A is a top plan view, the vent-key being omitted;
- Fig. 2 is a cross-section along the line 2-2 of Fig. 1A;
- Fig. 3 is a longitudinal section on a larger scale of one oboe in the region of the octave-vent tube;
- Fig. 4 is a section along the line 4-4 of Fig. 3.

Referring first to the Figs. 1 and 2, the octave-vent tube 1 of a type customary in the clarinet, is, in accordance with the present invention, surrounded by a tubular cap or body 2, forming around the octave-vent tube 1, a resonance space 3 opened freely towards the inside of the clarinet.

This space is bounded, on the one hand, by the outer peripheral wall 4 of the vent tube, and on the other hand, by the inner peripheral wall 5 of the cap. In the form of an embodiment shown, this inner wall 5 has, starting from the inside of the instrument, first of all, a cylindrical shape parallel to the wall 4, and then a curved-in shape at an end portion thereof, so as to contact the wall 4 completely therearound at that part of this wall which is nearest the outside of the instrument. The inner end of body 2 projects into the bore of the instrument but terminates slightly short of the inner end of the vent tube. In the embodiment here shown, the vent tube 1 is forced into the central opening 6, provided in the cap 2 and the latter is screwed into the body 1 of the clarinet. The outer end of tube 1 is peened over the outer end of member 2 and forms a valve seat. The customary octave vent controlling key is shown at 8 in Fig. 1.

Figs. 3 and 4 show, on a larger scale, an embodiment or form of the invention particularly well adapted to the oboe. The octave vent 9 is provided with an inner tubular passage constituted by three cylindrical parts 10, 11, 12, of a diameter which decreases from the outside toward the inside of the instrument. The vent tube 9 is surrounded along the length of the cylindrical channel 12 by a resonance space 13 determined by the inner peripheral wall 14 of a cap 15 which projects into the bore of the instrument. This wall is essentially cylindrical and parallel to the axis of the vent tube. In the embodiment shown, vent tube 9 is connected by screwing the same into cap 15, and the latter is fastened in any suitable manner in the body 16 of the oboe. The outer end of member 8 forms a valve seat. The key for controlling octave vent 9 is indicated at 17 in Fig. 3.

The improvements in the quality and in the other above mentioned characteristics of the tones produced in playing instruments provided with octave vents embodying the present invention are clearly recognized in practice as a result of the comparison of the musical sounds produced in the playing of instruments having octave vents of the present invention with the musical sounds produced in the playing of instruments having octave vents of the old type. I believe that the improved results are due, at least in part, to the following considerations although it may be possible that the underlying theory may be different.

It is known that the transmission of sound from the bell end of a clarinet or similar instrument will be diminished by opening a cylindrical vent in the side of the tube. This loss is due in part to radiation of sound through the vent, and
in part to the energy expended in producing motion of the air in the tube of the vent. Additionally, a further loss takes place at the inward end of the vent tube. These losses are the cause of the difficulty of producing notes by the use of such instruments. My improved vent materially diminishes the total of these losses. A vent tube offers a certain complex impedance to the transmission of sound of the desired pitch. This impedance includes each of the factors mentioned above, of which the loss at the inward end of the tube will in many cases be an important part. With vents of the type previously employed, for example, the vent tube opens abruptly into the bore of the instrument. In the vent tube, air is moving axially of the tube, and immediately below the opening of the vent tube, inside the bore, air is moving axially of the bore. As these two motions combine at the opening of the tube, a very complicated motion pattern results. However, by the application of my resonance space around the opening of the vent, I provide additional space in which this motion pattern may form, and I thus materially reduce the impedance of the opening. The impedance above referred to applied with respect to the fundamental pitch of each note to be produced, and also to each of the partials or harmonics which give the note its characteristic quality or timbre. The impedance of the vent will normally be greater for the higher pitched partials than for the fundamental pitch of any note, and any decrease in the impedance will therefore have greater effect in increasing the partials than in increasing the fundamental. As a result, my improved vent notably improves the timbre of the tones produced, by increasing their content of the quality-giving partials.

While I have shown and described the preferred embodiment of the invention, it will be understood that the latter may be embodied otherwise than as here specifically disclosed. Also, it will be understood that the invention, while illustrated in connection with a clarinet and with an oboe, is likewise applicable to saxophones, bassoons, and in general to all wind instruments provided with an octave vent or the like. Therefore, I do not wish to be limited to the invention as herein illustrated or specifically described except to the extent which may be required by the scope of the appended claims. Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A musical wind instrument of the class described provided with an octave vent having a key-controlled vent tube and means forming a chamber or space surrounding said tube and extending axially thereof in communication at its inner end with the bore of the instrument, the inner end of said chamber-forming means extending into the bore of the instrument.

2. A musical wind instrument of the class described provided with an octave vent having a key-controlled vent tube and means forming a chamber or space surrounding said tube and extending axially thereof in communication at its inner end with the bore of the instrument, the inner end of said chamber-forming means extending into the bore of the instrument, said chamber-forming means comprising a tubular body having an end portion engaging said vent tube near the outer end thereof.

3. A musical wind instrument of the class described provided with an octave vent having a key-controlled vent tube and means forming a chamber or space surrounding said tube and extending axially thereof in communication at its inner end with the bore of the instrument, said chamber-forming means comprising a tubular body having an end portion engaging said vent tube near the outer end thereof, and projecting into the bore of the instrument beyond the inner end of said vent tube.

4. A musical wind instrument of the class described provided with an octave vent having a key-controlled vent tube and means forming a chamber or space surrounding said tube and extending axially thereof in communication at its inner end with the bore of the instrument, said chamber-forming means comprising a tubular body having an end portion engaging said vent tube near the outer end thereof and projecting into the bore of the instrument beyond the inner end of said vent tube.

5. A musical wind instrument of the class described provided with an octave vent having a key-controlled vent tube and means forming a chamber or space surrounding said tube and extending axially thereof in communication at its inner end with the bore of the instrument, said chamber-forming means comprising a tubular body having an end portion engaging said vent tube near the outer end thereof and projecting into the bore of the instrument beyond the inner end of said vent tube.

6. A musical wind instrument of the class described provided with an octave vent having a key-controlled vent tube and means forming a chamber or space surrounding said tube and extending axially thereof in communication at its inner end with the bore of the instrument, the inner end of said chamber-forming means extending into the bore of the instrument, said vent tube having an axial passage provided with parts of different diameters increasing in size from the inner end of said vent tube toward the outer end thereof.

7. A musical wind instrument of the class described provided with an octave vent having a key-controlled vent tube and means forming a chamber or space surrounding said tube and extending axially thereof in communication at its inner end with the bore of the instrument, said chamber-forming means comprising a tubular body having an end portion engaging said vent tube near the outer end thereof, the inner end of said tubular body extending into the bore of the instrument, the outer end of said vent tube extending over the outer surface of said tubular body and providing a valve seat for the controlling key.

8. A musical wind instrument of the class described provided with an octave vent having a key-controlled vent tube and means forming a chamber or space surrounding said tube and extending axially thereof in communication at its inner end with the bore of the instrument, said chamber-forming means comprising a tubular body threaded into the side wall of the instrument and having an end portion engaging said vent tube in gripping relation therewith completely therearound, the inner end of said tubular body projecting into the bore of the instrument, the outer end of said vent tube extending over the outer surface of said tubular body and providing a valve seat for the controlling key.
9. A musical wind instrument of the class described provided with an octave vent having a key-controlled vent tube and means forming a chamber or space surrounding said tube and extending axially thereof in communication at its inner end with the bore of the instrument, said chamber-forming means comprising a tubular body having an end portion engaging said vent tube near the outer end thereof, and projecting into the bore of the instrument beyond the inner end of said vent tube, the outer end of said vent tube extending over the outer surface of said tubular body and providing a valve seat for the controlling key.

10. A musical wind instrument of the class described provided with an octave vent having a key-controlled vent tube and means forming a chamber or space surrounding said tube and extending axially thereof in communication at its inner end with the bore of the instrument, the inner end of said chamber-forming means extending into the bore of the instrument, said vent tube having an axial passage provided with parts of different diameters increasing in size from the inner end of said vent tube toward the outer end thereof, the outer end of said vent tube extending over the outer surface of said tubular body and providing a valve seat for the controlling key.

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