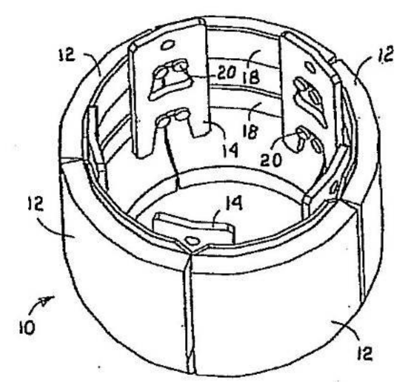
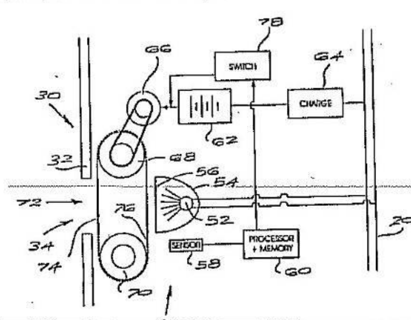
PATENT APPLICATION

25th October 2007



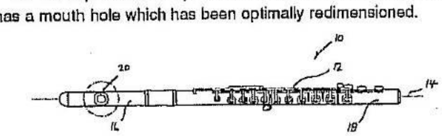
21: 2007/08883. 22: 17 October 2007. DA: 27-08-2008.
51: G 08 G.
71: Grobbelaar, Warren.
72: Grobbelaar, Warren.
33: ZA. 31: 2006/09149. 32: 2 November 2006.
54: **Traffic light and traffic violation system.**
00: 29.

57: Back-up traffic light apparatus which includes a non-light emitting mechanism and a controller which, in the event of traffic light malfunction, causes movement of the mechanism thereby to emulate operation of the traffic light.



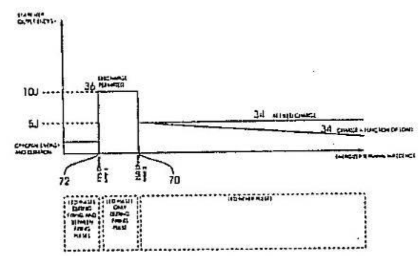
21: 2007/10990. 22: 18 December 2007. DA: 11-09-2008.
51: G 10 D.
71: Botha, Michael C.
72: Botha, Michael C.
33: —. 31: —. 32: —.
54: **A musical apparatus.**
00: 15.

57: An improved mouthpiece member for a flute headjoint which has a mouth hole which has been optimally redimensioned.



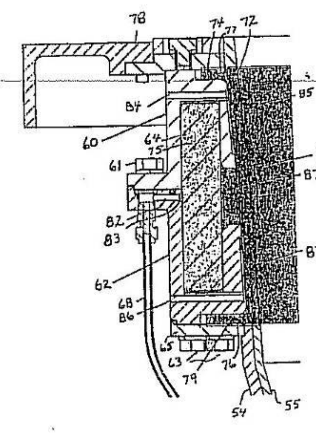
21: 2007/10834. 22: 13 December 2007. DA: 11-09-2008.
51: A 01 K.
71: Nemtek Holdings (Pty) Ltd.
72: Hurly, Leslie Sean.
33: ZA. 31: 2006/09786. 32: 24-11-2006.
54: **Enhanced safety operation of an electric fence energiser.**
00: 27.

57: Apparatus for energising an electric fence which includes a first pulse generator for generating a train of pulses, an impedance monitor which monitors the impedance of a fence to which the pulse train is applied, and a controller which, in response to the impedance monitor, controls the pulse generator so that that the energy per pulse is dependent on the impedance of the fence.



21: 2007/08759. 22: 15 October 2007. DA: 27-08-2008.
51: B 04 B, B 01 D.
71: McAlister, Steven A.
72: McAlister, Steven A.
33: US. 31: 60/672,024. 32: 18 April 2005.
54: **Centrifugal concentrator with variable diameter lip.**
00: 23.

57: A centrifugal separator of the type having migration, retention and lip zones of the interior surface of the rotating bowl has a variable diameter lip to increase the amount of target material retained in the retention zone.



21: 2007/08658. 22: 11 October 2007. DA: 12-09-2008.
51: G 01 B.
71: Orava Applied Technologies Corporation.
72: Orava, John.
33: US. 31: 60/670,569. 32: 12 April 2005.
54: **Responsive structural elements.**
00: 55.

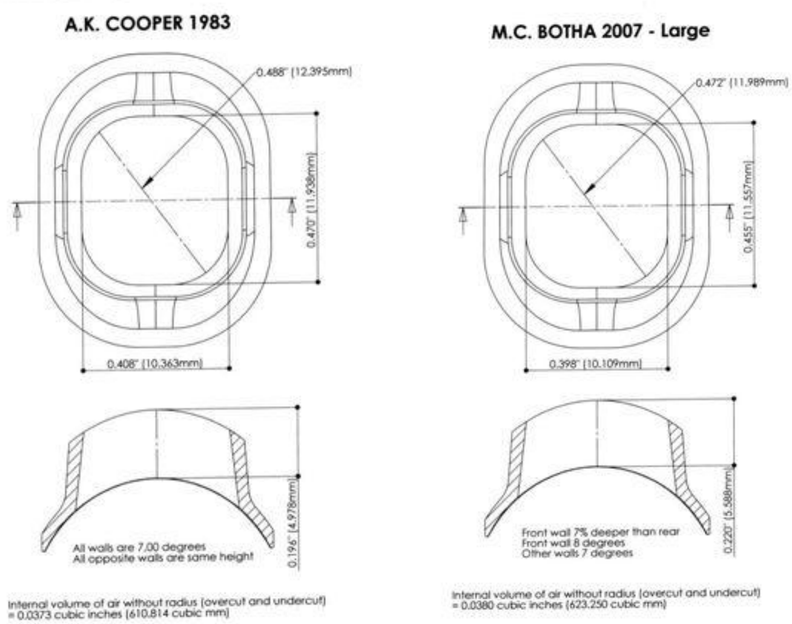
<u>Introduction</u>

The transverse flute is a tube held laterally, which contains a column of air. The column of air is moved by blowing across a vertical hole called the embouchure hole. The embouchure hole is a venturi, when air is directed across it and down into it pressure formation takes place. This creates a standing wave which is contained by the tube. It is probable that this principle has been known since prehistoric times and in effect the fact that a note can be sounded is as simple as blowing across a bottle.

Various combinations of keywork and changes in pressure then produce the notes which are played on the flute. This application does not deal with this, but deals merely with the venturi itself.

The embouchure hole comprises 3 components; the lip plate, riser and transverse tube.

This patent application sets out the rationalization of a new development of the embouchure hole which has certain distinct advantages for the modern flute.



<u>The Prior Art</u>

Notwithstanding that this principle has been known for centuries there has been a movement in terms of the shape of the embouchure hole from a round or oval hole to a rounded rectangle. The first dimensions historically available are set out in Theobald Boehm's book, The Flute and Flute Playing 1871 (pp 22, 23 of 1964 Dover edition). Fundamental sizes are given; these are a width side to side of 12,2mm, a size across of 10,4mm. The depth of this hole is not specified.

Boehm states *"In my opinion an angle of 7° is best adapted to the entire compass of tones, the walls being 4,2mm thick and the mouth hole 10 mm wide and 12mm long, is best suited to most flute players"*.

In imperial measurements which are more commonly used on flutes, these sizes correspond to 10mm - .409" and 12mm - .480". In Boehm's work, while he specifies an angle of 7° it is more common that the angles on the walls are set at 6°.

The next significant development of the Prior Art is found in the work of Albert Cooper. Cooper's work is a development of Boehm and has formed the basis for the vast majority of embouchure holes in modern flutes. The writer was trained by Cooper and is familiar with his work, and attaches two documents in respect of the Prior Art as it was in 1983. Cooper gives sizes of length – 470, width – 408, diagonal – 488 and depth 196.

Cooper also describes his headjoint as having 7°strike wall and the other three walls are of varying amounts of more than 7°. In other words these are undercut (radiused) increasingly. All opposite walls are equal height, thus the two side walls or shoulders have the same height and the opposite walls, the front and the back have the same height. The volume of an unradiused Cooper is 0.0373 cubic inches (610.814 cubic mm)

<u>The Difficulties with the Prior Art</u>

These can be understood when the following factors are considered:

1. The flute has a compass or range from approximately C^1 (middle C) to C^3.

2. The embouchure hole has sizes and depths which vary. A large embouchure hole favours the low notes through to G^2. A small embouchure hole favours the high notes from G^2 to high C^3.

3. A large embouchure hole is louder. It however tends to be clumsy and lacks agility.

4. A small embouchure hole as stated, favours the high notes and is more accurate and agile than a large embouchure hole.

Boehm 1871 pp 23 set the problem out in terms of the sizing of embouchure holes by stating, *"For the same reason a larger mouth-hole will produce a louder tone than a smaller one, but this requires a greater strength in the muscles of the lip, because there is formed a hollow space under the lip which is unsupported. More than this, it is often difficult to keep the air current directed at the proper angle, upon which the intonation and the tone quality for most part depend."*

What this means is that it is difficult from lip and facial muscle strength point of view to maintain the appropriate levels of fine motor co-ordination to control a large embouchure hole. The desire for a large embouchure hole is a consequence that the flute is louder and produces a greater degree of tonal projection in orchestral and concert settings.

The advantage of my invention, the MCB Pattern Headjoint is that it overcomes the dichotomy of the large versus small embouchure hole. The invention combines the qualities of easiness of playing and agility of a small embouchure hole with the volume and dark tone colour properties of a large embouchure hole, in a configuration that is easy to play.

The design thus has a very wide, dynamic range. It can be played extremely loudly, and extremely softly. The third register plays very easily which is characteristic of a small embouchure hole and the bottom is loud and powerful which is the characteristic of a large embouchure hole. It thus represents a synthesis of two opposed designs.

<u>What is your Answer to these Problems?</u>

In determining an answer to these problems over many years of experimenting, I determined that the sizing of embouchure holes actually determined that a certain volume of air was required in the embouchure hole (venturi) and that an optimum amount would act upon the air in the tube most effectively. The Cooper pattern is the standard. It seems to be the largest volume embouchure hole that can be comfortably played. Many players however find it difficult to control, particularly ‘average’ players.

<u>How is the Solution Performed?</u>

I determined to re-configure the volume of the Cooper. I measured the unradiused volume of the headjoint as set out by Cooper as 0.373 cubic inches (610.814 cubic mm).

My invention has been to reduce the horizontal physical size (width and length) of the embouchure hole but to increase its vertical dimensions (depth).

The reduction in dimensions creates a size which the facial muscles can control and the increase in depth enhances the venturi effect and creates the requisite amount of pressure. These changes in configuration enable the flute to be played more effectively.

A range of sizes exist. These in thousandths of an inch are as follows:

Width – between ,390 and ,398

From side to side – between ,450 and ,455

Depth – between ,215 and ,220

Diagonal – between ,368 and ,374

A further development is to increase the depth of the front (strike) wall. The side walls in Cooper and Boehm designs are set at the same depth in my embouchure. The strike wall and the rear wall are differently configured. The strike wall is approximately 7% deeper than the rear wall. The reason for this is that more air is scooped into the embouchure hole than merely blown across it.

This adds to the pressure effect. This is a major departure from the prior art. Also, the strike wall has a greater surface area which also enhances pressure. The MCB large yields a volume greater than Cooper, but remains easy to play.

These dimensions yield an embouchure hole volume of between .0365 cubic inches (598.102 cubic mm) and 0.0380 cubic inches (623.250 cubic mm) which is larger than the prior art. This is in keeping with Boehm 1871 translated 1964, *"By this means the molecular vibrations of the tube are excited, producing a tone as long as the air stream is maintained; it follows therefore that the tone will be stronger the greater the number of air particles acting upon the tone-producing air column in a given time."* Thus the current patent application resolves a problem known of for many years.

My invention reconfigures the embouchure volume into an optimal configuration and also allows an increase in volume over the Cooper pattern, as set out in the MCB large pattern. Thus embracing the effect noticed by Boehm.

What are the Benefits?

The embouchure holes associated with the Prior Art have been developed largely through co-operation with virtuoso level players. Embouchure sizes of this size are difficult to play for the "average" player. The MCB Pattern is a very much easier to play embouchure and is suitable to more flautists and it enables them to play more musically. The headjoint typically is characterised by great agility, a wide dynamic range and has a very traditional deep and dark sound which is sought after.

In addition the MCB pattern allows virtuoso players to create greater musical effect.

Patent Application – Background of the invention

[0001] This invention relates generally to a flute, more specifically to a flute headjoint and in particular an embouchure hole of the headjoint.

[0002] The embouchure hole is a specific term for the aperture in the headjoint over which the flautist blows to produce sound, and its ancillary structure. The embouchure hole includes a lip plate on which the lower lip of the flautist rests when playing the flute, a riser which elevates the lip plate from the body of the flute and a transverse tube formed within the riser and through a wall of a cylindrical body of the headjoint.

[0003] There has been a movement, over the centuries, in the shape and configuration of the embouchure hole. The hole shape has evolved from a round or oval hole to a rounded rectangle. The first figures historically available in respect of embouchure hole dimensions are set out in Theobald Boehm's book, *The Flute and Flute Playing* 1871 (pp 22, 23 of 1964 Dover edition). The dimensions given are a hole width of 10,4mm and a hole length of 12,2mm. A hole depth is however not specified.

[0004] Boehm states in his book that "*In my opinion an angle of 7° is best adapted to the entire compass of tones, the walls being 4,2mm thick and the mouth hole 10mm wide and 12mm long, is best suited to most flute players".*

[0005] In imperial measurements, which are more commonly used in reference to flute dimensions, the dimensions referred to above are 0.409 inches (10mm) and 0.480 inches.(12mm) (" hereinafter designates inches). In Boehm's work, while he specifies an angle of 7°, being the angle of undercut, with respect to the perpendicular, of the walls of the transverse tube, it is more common that the angles on the walls are set at 6°.

[0006] The next significant development, in respect of the embouchure hole shape and configuration, came in the work of Albert Cooper. Cooper's work was a development of Boehm's and has formed the basis for the vast majority of embouchure holes in modern flutes. Cooper teaches a hole length of 0.470", a hole width of 0.408", a diagonal dimension of 0.488" and a hole depth 0.196".

[0007] Cooper teaches the transverse channel of the embouchure hole as having a strike wall, i.e. the wall upon which a jet of air from the flautist's mouth is directed, as being undercut at a 7° angle with the other three walls of the transverse channel similarly undercut at 7° angles. Cooper states that opposing transverse channel walls should be of equal height. Cooper's teachings result in the volume of the transverse channel being at least 0.0373 cubic inches (610.814 cubic mm).

[0008] The concert pitch C flutes generally have a note range from approximately C^1 (middle C) to C^3. The notes a particular flute favours depend on the shape and configuration of the embouchure hole and the depth of the transverse channel. A large embouchure hole favours the low notes through to G^2. A small embouchure hole favours the high notes from G^2 to high C^3. Large embouchures holes also tend to produce a louder sound. The downside, however, is that a flute with a larger hole has a tendency to be clumsy and lack agility. Conversely, a small embouchure hole, whilst favouring the high notes, is more accurate and agile.

[0009] Boehm, in his book (pp 23), mentioned this compromise between size and sound, stating: *"For the same reason a larger mouth-hole will produce a louder tone than a smaller one, but this requires a greater strength in the muscles of the lip, because there is formed a hollow space under the lip which is unsupported. More than this, it is often difficult to keep the air current directed at the proper angle, upon which the intonation and the tone quality for most part depend".*

[0010] In other words, it is difficult from a lip and facial muscle strength point of view to maintain the appropriate levels of fine motor co-ordination necessary to control a large embouchure hole, although the desire for a large embouchure hole remains, given the consequence that the flute is louder and produces a greater degree of tonal projection in orchestral and concert settings.

[0011] The present invention at least partially addresses the aforementioned problems.

SUMMARY OF INVENTION

[0012] The invention provides a mouth piece member for a flute headjoint which includes a body which has an outwardly flared skirt, sidewalls which extend from the skirt and a mouth hole defined at a top edge of the sidewalls.

[0013] The sidewalls may include a strike wall to which a jet of air from a flautist's mouth is directed, a rear wall opposing the strike wall. and a pair of flanking walls.

[0014] The mouth hole, in cross section, may be shaped substantially rectangularly with rounded corners.

[0015] The longitudinal direction of the flute headjoint may define a first axial direction.

[0016] A second axial direction may be defined at a right angle to the first axial direction.

[0017] A third axial direction may be defined at a right angle to the first axial direction and the second axial direction.

[0018] The mouth hole may be maximally dimensioned to have:

a) a width in the first axial direction of from 0.450 inches to 0.455 inches;
b) a width in the second axial direction of from 0.390 inches to 0.398 inches; and
c) a diagonal distance, at 45º from the first axial direction, of from 0.468 inches to 0.472 inches.

[0019] The strike wall may have a depth in the third axial direction of from 0.222 inches to 0.227 inches.

[0020] The rear wall may have a depth in the third axial direction of from 0.207 inches to 0.212 inches.

[0021] Each flanking wall may have a depth in the third axial direction of from 0.215 inches to 0.220 inches.

[0022] The strike wall may be undercut by at least 8º from a line in the third axial direction.

[0023] The rear wall and the flanking walls may be undercut by at least 7º from a line in the third axial direction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The invention is further described by way of example with reference to the accompanying drawings in which:

Figure 1 is a plan view of a flute showing a flute headjoint as a component of the flute;

Figure 2 is a transverse sectional view, of a flute headjoint;

Figure 3 is a cross sectional view of the flute headjoint taken through a line 3-3 of Figure 2;

Figure 4 illustrates in plan the embouchure hole in a mouthpiece of the invention; and

Figure 5 is a cross sectional view of an embouchure hole according to the invention taken through line 5-5 in Figure 4.

DESCRIPTION OF PREFERRED EMBODIMENT

[0025] Figure 1 of the accompanying drawings illustrates a flute 10 which has a flute body 12, with a longitudinal axis 14 which defines a first axial direction, having a headjoint 16 and a tail portion 18. The headjoint includes a mouth piece 20.

[0026] Figure 2 illustrates in transverse section the headjoint 12 which is inserted into the tail portion 18. The headjoint includes a stopper 22 and a crown 24.

[0027] With reference to Figure 3 and Figure 5, the mouthpiece 20 includes a skirt 25, sidewalls 26 rising from the skirt, a lip plate 28 projecting outwardly from a top edge 29 of the sidewalls and a mouth hole 30, which, in plan view, is substantially rectangular in shape (see Figure 4) with rounded corners, which is defined at the top edge.

[0028] As shown in Figure 3, a flautist rests a lower lip (shown in dotted outline) atop the lip plate 28 as he directs a jet of air across the mouth hole 30. The jet of air (demarcated directionally as a pair of arrows) partly passes across the mouth hole and partly enters an interior 32 of the headjoint through the mouth hole. It is this bi-directional jet of air that produces the harmonics responsible for the sound that emanates from the flute 10.

[0029] Figure 4 and Figure 5 show the mouth piece 20 in greater detail with the sidewalls, respectively designated 26A, 26B, 26C and 26D, elevating the lip plate 28 above the skirt 25. The sidewalls define a channel 34.

[0030] When the flautist directs a jet of air across the mouth hole 30, the jet of air is directed towards the side wall 26B (hereinafter referred to as the strike wall) and more specifically at a strike edge 40.

[0031] In a first aspect of the invention, the mouth hole 30 is maximally dimensioned to have:

d) a width in the first axial direction of from 0.450 inches to 0.455 inches;
e) a width in the second axial direction of from 0.390 inches to 0.398 inches; and
f) a diagonal distance at 45º from the first axial direction of from 0.468 inches to 0.472 inches.

[0032] The applicant has found, after extensive observation and experimentation, that the volume of the channel 34 is of primary importance to the tonal qualities of the sound produced by a flute rather than the dimensions of the mouth hole 30. The mouth hole dimensions are only of secondary importance in their inextricable connection to the volume of the channel. However, the reconfiguring of the dimensions can improve the tonal and playing qualities of the instrument.

[0033] The strike wall 26B is undercut from the strike edge 40 at an angle of 8º from a line 48 in a third axial direction, which is at a right angle to the both the first axial direction and the second axial direction. The sidewalls 28A, 28C and 28D are undercut from the top edge 29 by an angle of 7º from respective lines in the third axial direction.

[0034] The strike wall 26B has a depth in the third axial direction of from 0.222 inches to 0.227 inches, the side wall 26A has a depth in the third axial direction of from 0.207 inches to 0.212 inches and the sidewalls 26C and 26D have depths in the third axial direction of from 0.215 inches to 0.220 inches.

[0035] Without being bound by the following explanation, the applicant believes that the enhanced tonal qualities produced by the above aspects of the invention on the mouth piece 20 are a result <u>in part of the greater angle, depth and area of the strike wall allowing the air directed into the mouth hole to be more effectively utilised</u> thus producing air jet pressure oscillations which have a harmonic enhancing effect. Furthermore the reconfiguration of Cooper's pattern into a pattern which is narrower and less wide, but deeper, giving a similar volume to Cooper, but the smaller dimensions (length, width & diagonal) of the embouchure make it easier for a player to exercise the fine motor co-ordination required to produce good flute tone.

[0036] Thus, the invention bridges the dichotomy of a larger mouth hole, with the generally louder tone it produces but which comes with increasing player difficulty, versus a smaller mouth hole, with the generally smaller tone it produces but which comes with lessening player difficulty. The invention thus represents a synthesis of two divergent objectives.