

July 17, 1956

T. R. FOLSOM
PIPE HARMONICA

2,754,714

Filed Oct. 22, 1952

2 Sheets-Sheet 1

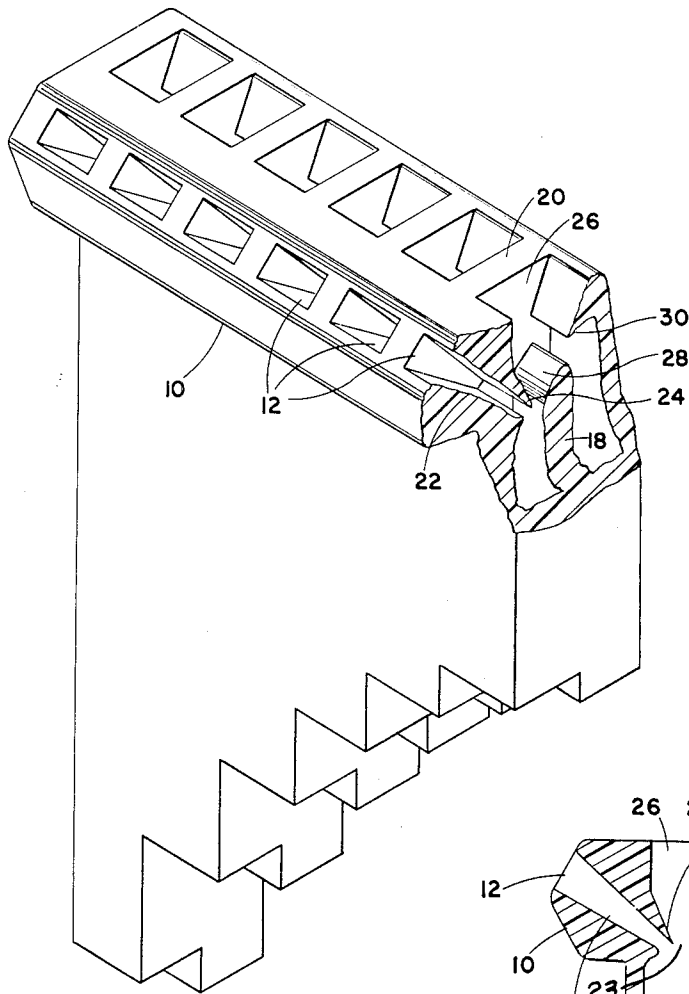


Fig. 1.

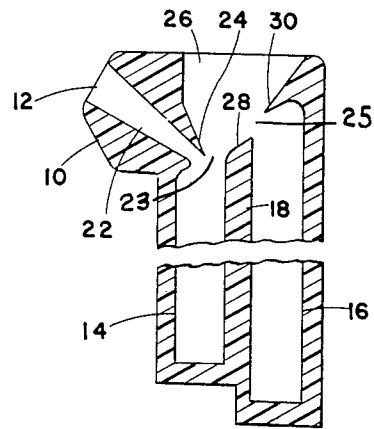


Fig. 2.

INVENTOR.
THEODORE R. FOLSOM
BY

Knox & Knox
AGENTS.

July 17, 1956

T. R. FOLSOM

2,754,714

PIPE HARMONICA

Filed Oct. 22, 1952

2 Sheets-Sheet 2

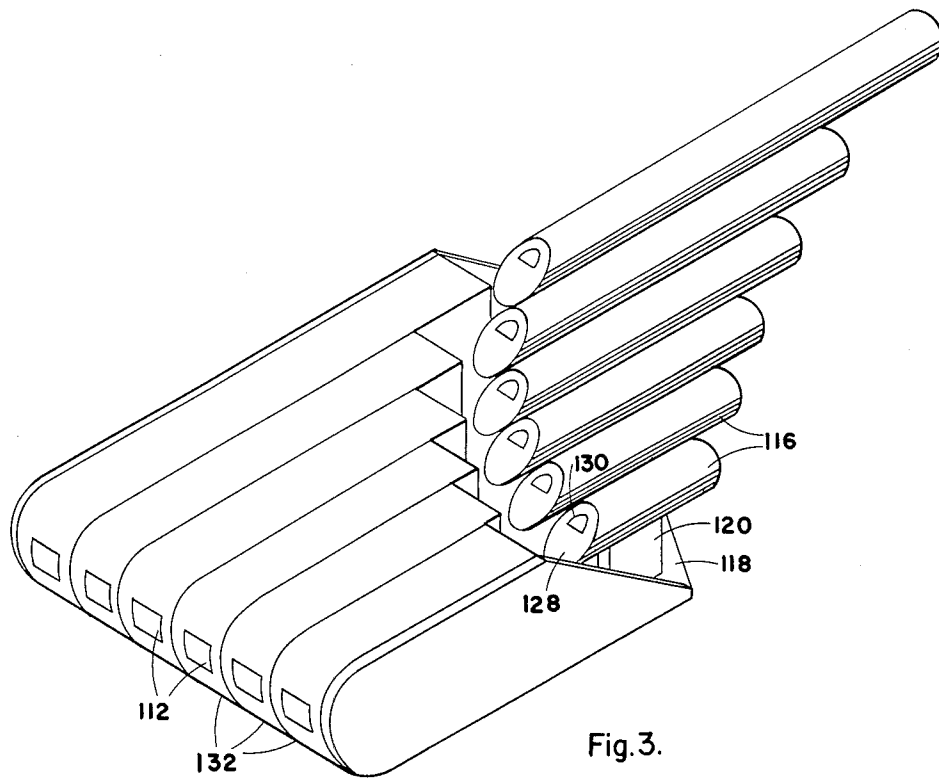


Fig. 3.

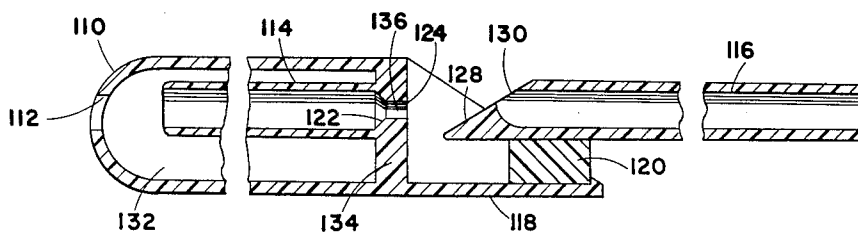


Fig. 4.

INVENTOR.
THEODORE R. FOLSOM
BY

Knox & Knox
AGENTS.

1

2,754,714

PIPE HARMONICA

Theodore Robert Folsom, San Diego, Calif.

Application October 22, 1952, Serial No. 316,222

17 Claims. (Cl. 84-330)

The present invention relates generally to musical wind instruments, and more particularly to the harmonica type instrument employing pipes in lieu of reeds.

The primary object of this invention is to provide a wind instrument to be played by mouth after the style of an ordinary harmonica, but wherein a more pleasing and very different quality of music can be produced.

Another object of this invention is to provide a small portable wind instrument which can be played by anyone who has previously acquired the skill of playing a conventional harmonica, although it is obvious that anyone can learn to play the instant invention without prior acquaintance with an instrument of any other character.

Another object of this invention is to provide a small musical wind instrument which can be played by mouth, exhalation and inhalation easily producing air streams of sufficient power to excite inhalation-responsive resonator tubes or pipes as well as exhalation-responsive resonator pipes, to give a completely satisfactory volume of musical sound. In other words, it is an object of this invention to provide a pipe harmonica which does not require great lung power.

Yet another object of this invention is to provide a harmonica type instrument employing pipes in lieu of reeds, whereby chords can be achieved, by the use of the tongue or otherwise, inasmuch as more than one inhalation-responsive resonator pipe can be made to sound simultaneously, and more than one exhalation-responsive resonator pipe can be similarly sounded simultaneously.

Another object of this invention is to provide a harmonica type instrument which can be constructed in a great variety of styles, the mere shifting of the pipes relative to other pipes lending a completely different appearance to the instrument, and it is a particular advantage that this instrument can be constructed completely of plastic material. It should also be noted that the pipes can be bent to achieve compactness or more pleasing appearance.

An ancillary object is to provide an instrument which is inexpensive to manufacture, it being completely practicable to manufacture such an instrument by conventional and well known apparatus and methods.

Finally, it is an object of this invention to provide an instrument which carries into practice completely novel principles which are basically related to the provision of an assembly of resonators of reedless type arranged in such a manner and communicating with a mouthpiece so that air blown or exhaled will excite certain of said resonators, while air inhaled and causing an air stream in the opposite direction will excite only another separate set of resonators, even though the exhalation and inhalation air streams pass through the same communicating canals, all without resort to use of reeds or valves. When valves are used excessive lung power would be necessary, and all valves tend to be sluggish and to fail to respond rapidly to the player's will. Furthermore, valves interfere with the speaking properties of the pipes in respect to both pitch and timbre. Finally valves frequently get

2

out of order and are difficult to clean. In the invention as disclosed herein, the mouth of the inhalation-responsive resonator pipes are close to the mouth of the corresponding exhalation-responsive resonator pipes, special means being provided to attain exclusive excitation of the proper pipe according to the direction of the air stream. It is noteworthy also that a further novel principle has been introduced in this invention, namely, the provision for bending the inhalation air stream around a vibration-exciting sharp edge, rather than impinging such air stream directly upon the lip as old in pipe organ art, with the beneficial effects to be detailed hereinafter.

With these and other objects definitely in view, this invention consists in the novel construction, combination and arrangement of elements and portions, as will be hereinafter fully described in the specification, particularly pointed out in the claims, and illustrated in the drawings which form a material part of this disclosure and wherein similar characters of reference indicate similar or identical elements and portions throughout the specification and throughout the views of the drawings, and in which:

Fig. 1 is an isometric view of one preferred form of my pipe harmonica;

Fig. 2 is a vertical sectional view taken through any one of the openings in the mouthpiece of the harmonica on a plane through said opening and the corresponding resonator pipes;

Fig. 3 is an isometric view of the same invention in a slightly modified form; and

Fig. 4 is a vertical transverse sectional view taken through any one of the openings in the mouthpiece of the harmonica on a plane through said openings and the corresponding resonator pipes.

Referring now to the drawings in detail, the embodiment illustrated in Figs. 1 and 2 is an instrument of unitary construction, it being proposed that this device can conveniently be fabricated of one of many suitable plastic materials, it being understood, however, that the instant invention is not dependent upon any particular mode of fabrication. In this embodiment, an elongated mouthpiece 10 is provided with a plurality of aligned openings 12. The mouthpiece 10 is formed integral with an inhalation-responsive resonator pipe 14 and an exhalation-responsive resonator pipe 16, these pipes being in side-by-side or tandem relation and separated by a longitudinal wall 18. The pipes 14 and 16 are arranged in pairs, the lengths varying as required to provide the necessary tonal scale, the pairs being partitioned from each other by transverse walls 20, so that an opening 12 communicates with each pair of pipes by means of a canal 22.

Each canal 22 tapers from the corresponding opening 12 to a smaller cross-sectional size at the mouth 23 of the inhalation-responsive resonator pipe 14, a sharp edged lip 24 being provided at the termination of the canal 22 at said mouth. Air is drawn around the sharp edge 24 and into the canal 22, when the player inhales. The sharp bending of this air stream at the mouth of the pipe 14 excites this resonator pipe to produce a tone of a pleasing quality and timbre, the pitch being determined largely by the length of the pipe 14.

The top of the longitudinal wall 18, between each pair of tubes, is beveled to comprise a deflector 28, this deflector extending partly above the vibration-exciting sharp edge 24 and being positioned to assure that the air stream must experience a sharp bend around this edge 24 when the player inhales. This same deflector 28 is positionally arranged and shaped, with reference to another sharp edge 30 at the mouth 25 of the resonator pipe 16 to assure that the air stream resulting from exhalation by the player will impinge directly upon this second mentioned

edge 30, causing the exhalation-responsive resonator pipe 16 to sound a musical tone of a pitch which is a function of the length of the pipe 16. In this disclosure, it is thought to be unnecessary that the question of overtones or the particular character of tone produced need be considered at any length, the principal emphasis being laid upon the structure of the instrument and the showing of how the invention has been reduced to practice, but it is noteworthy that the opening 12 and the mouths 23 and 25 of the pipes 14 and 16, with the corresponding edges 24 and 30, are arranged in the order illustrated. In other words, the mouth 23 of the inhalation-responsive resonator pipe 14 should be in the middle of this novel sequence or series of elements. On exhalation by the player, the air stream passes the edge 24 without exciting the pipe 14, the canal 22 serving merely to confine the exhalation air stream so that the same, after being deflected from the deflector 28, is in the form of a well defined jet which impinges on the lip 30 causing the exhalation-responsive resonator pipe 16 to sound. Upon inhalation by the player, the air enters the canal 22 without any tendency to cause the excitation of the pipe 16, while causing forceful excitation of the pipe 14 by reason of the sharp bending of this air stream around the lip 24, together with the subsequent rapid expansion of this same inhalation air stream as a result of the tapering of the canal 22, this last mentioned feature being important in the carrying of this invention into practice. The mouth 23 of the pipe 14 opens freely to the surrounding atmosphere so that the sound emits freely and can be readily heard in full volume.

In the embodiment of this invention illustrated in Figures 3 and 4, included in this disclosure to show that this invention is not limited to the use of closed pipes, the mouthpiece 110 with the openings 112 therein may be considered the full equivalent of the corresponding elements in the first described embodiment. The inhalation-responsive resonator pipe 114 is merely modified to the extent that the same is an open pipe, with one open end disposed toward the opening 110, while the exhalation-responsive resonator pipe 116 is arranged substantially coaxially of the pipe 114 and supported on a frame extension 118 having brackets 120 individually supporting the pipes 116. As before, the pipes 114 and 116 are arranged in pairs, of varying lengths as desired, each pair being in the same novel communication sequence with a single mouthpiece opening 112 as illustrated in the preceding embodiment, the mouth of the inhalation-responsive pipe being closer to the mouthpiece. In this embodiment, the sharp edge 124 at the mouth of the inhalation-responsive resonator pipe 114 is in the form of a sharp edge at the termination of a cylindrical hole. Because of this novel arrangement the inhalation-responsive pipe mouth is fully exposed so as to permit free escape of sound energy therefrom. However, air from the adjacent space bends sharply around this sharp edge 124 and thereafter expands in the tapered canal 122 in a manner effectually similar to that in the preceding embodiment, when the player inhales, and the pipe 114 is excited to sound a musical tone according to the length and other characteristics of this pipe. The deflector 128 takes the form of a plane inclined surface provided on an extending end portion of the exhalation-responsive resonator pipe 116, this deflector being found to increase the efficiency of the instrument. As before, the deflector 128 collimates the air stream into a well defined air jet to impinge upon the sharp edge 130 at the mouth of the pipe 116, upon exhalation by the player. Obviously, the pipe 116 can also be of closed variety. In this embodiment, it is preferable to supply a wind chest 132 immediately adjacent to the openings 112, a separate wind chest 132 being necessitated for each opening, and the pipes 114 are mounted on a wall 134 forming the end of the wind chest 132 remote from the corresponding opening 112. The said edge 124 comprises

a vibration-exciting sharp boundary at an end of a cylindrical hole 136 in this wall 134.

The operation of this invention will be clearly comprehended from a consideration of the foregoing description of the mechanical details thereof, taken in connection with the drawings and the above recited objects, especially since the functions of the various elements have been explained. It will be obvious that all said objects and advantages are amply achieved by this invention.

Further description would appear to be unnecessary.

It is understood that minor variation from the form of the invention disclosed herein may be made without departure from the spirit and scope of the invention, and that the specification and drawings are to be considered as merely illustrative rather than limiting.

I claim:

1. A reedless and valveless musical wind instrument comprising a mouthpiece having a plurality of aligned openings, a pair of resonator pipes in constant communication with each of said openings, one of said resonator pipes having a vibration-exciting sharp edge directed away from the corresponding opening and the other having a vibration-exciting sharp edge directed toward the corresponding opening and each of said pipes having its own individual sharp lip edges and said edges being widely spaced apart.

2. A musical wind instrument comprising a mouthpiece having a plurality of aligned openings, a pair of resonator pipes in communication with each of said openings, one of said resonator pipes having a vibration-exciting sharp edge directed away from the corresponding opening being exclusively inhalation-responsive and the other having a vibration-exciting sharp edge directed toward the corresponding opening and being exclusively exhalation-responsive with relation to inhalation and exhalation through the corresponding openings in said mouthpiece, said pipes having mouths arranged in tandem with the corresponding opening, the mouth of the inhalation-responsive pipe being between the other mouth and said opening each of said pipes having its own individual sharp lip edges and said edges being widely spaced apart, said edges being the only sharp edges adjacent the mouths, and the edge at the mouth of the exhalation-responsive pipe being widely spaced from the mouth of the inhalation-responsive pipe and completely inoperative in relation thereto.

3. A musical wind instrument comprising a mouthpiece having a plurality of aligned openings, a pair of resonator pipes in communication with each of said openings, one of said resonator pipes having a vibration-exciting sharp edge directed away from the corresponding opening being exclusively inhalation-responsive and the other having a vibration-exciting sharp edge directed toward the corresponding opening and being exclusively exhalation-responsive with relation to inhalation and exhalation through the corresponding openings in said mouthpiece, said pipes having mouths arranged in tandem with the corresponding opening, the mouth of the inhalation-responsive pipe between the other mouth and said opening, a sharp edge at the mouth of the inhalation-responsive resonator pipe, a second sharp edge at the mouth of the exhalation-responsive resonator pipe and spaced a considerable distance from the first mentioned edge, a canal leading from said opening and terminating at said edge, and a deflector between said mouths and substantially opposite the inner end of said canal to deflect an exhalation air stream toward the second sharp edge.

4. A valveless musical wind instrument comprising a mouthpiece having a plurality of aligned openings, a canal leading from each of said openings, a pair of resonator pipes in communication with each of said canals, one of said resonator pipes having a vibration-exciting sharp edge directed away from the corresponding open-

5

ing being exclusively inhalation-responsive and the other having a vibration-exciting sharp edge directed toward the corresponding opening and being exclusively exhalation-responsive with relation to inhalation and exhalation through the corresponding openings in said mouthpiece, said pipes having mouths, said exhalation-responsive pipe having at its mouth a sharp vibration-exciting edge, and means disposed substantially opposite the inner end of the corresponding canal to direct an exhalation air stream directly against said edge.

5. A musical wind instrument comprising a mouthpiece having a plurality of aligned openings, a pair of resonator pipes in communication with each of said openings, one of said resonator pipes having a vibration-exciting sharp edge directed away from the corresponding opening being exclusively inhalation-responsive and the other having a vibration-exciting sharp edge directed toward the corresponding opening and being exclusively exhalation-responsive with relation to inhalation and exhalation through the corresponding openings in said mouthpiece, each of said pipes having a mouth, each of said mouths having a sharp vibration-exciting edge, said edges being widely spaced apart, and a deflector, said edges and deflector being positioned to cause an inhalation air stream to bend sharply around said edge of the inhalation-responsive resonator pipe mouth, said deflector being positioned to direct an exhalation air stream onto said sharp edge of the exhalation-responsive resonator pipe mouth, said edges being the only sharp edges adjacent the mouths, and the edge at the mouth of the exhalation-responsive pipe being widely spaced from the mouth of the inhalation-responsive pipe and completely inoperative in relation thereto.

6. In a valveless musical wind instrument, a mouthpiece having an opening, a first resonator pipe, and a second resonator pipe, said two pipes each having its mouth in constant free communication with said single mouthpiece opening and having vibration-exciting sharp edges directed away from and toward said opening respectively, said sharp edges being widely spaced apart so that a player is enabled to excite either pipe depending alone upon the direction of the air current induced in said opening.

7. A reedless and valveless harmonica-type wind instrument comprising a body member including a mouthpiece having a plurality of aligned openings, pairs of resonator pipes, a canal leading from each pair of resonator pipes to one of said openings, one of said pipes having a mouth immediately adjacent to the end of the corresponding one of said canals and having a vibration-exciting acute angled sharp edge at said mouth and directed away from said one canal so that said edge and said one pipe are exclusively inhalation-responsive, the other one of each pair of pipes being spaced a considerable distance from said sharp edge and having a vibration-exciting sharp edge directed toward said canal so that the last mentioned edge and said other pipe are exclusively exhalation-responsive.

8. A reedless and valveless harmonica-type wind instrument comprising a body member including a mouthpiece having a plurality of aligned openings, pairs of resonator pipes, a canal leading from each pair of resonator pipes to one of said openings, one of said pipes having a mouth immediately adjacent to the end of the corresponding one of said canals and having a vibration-exciting sharp edge at said mouth and directed away from said one canal so that said edge and said one pipe are exclusively inhalation-responsive, the other one of each pair of pipes being spaced from said canal and having a vibration-exciting sharp edge directed toward said canal so that the last mentioned edge and said other pipe are exclusively exhalation-responsive, said body member including a smooth surfaced deflector disposed in substantially opposed relation to the inner end of said canal to

6

direct an exhalation air stream toward said second mentioned edge in the form of a columnated jet.

9. An instrument according to claim 8 wherein said deflector comprises a portion of one side of one of said pipes.

10. A reedless and valveless harmonica-type wind instrument comprising a body member including a mouthpiece having a plurality of aligned openings, pairs of resonator pipes, a canal leading from each pair of resonator pipes to one of said openings, one of said pipes having a mouth immediately adjacent to the end of the corresponding one of said canals and having a vibration-exciting sharp edge at said mouth and directed away from said one canal so that said edge and said one pipe are exclusively inhalation-responsive, the other one of each pair of pipes being spaced a considerable distance from said canal and having a vibration-exciting sharp edge directed toward said canal so that the last mentioned edge and said other pipe are exclusively exhalation-responsive, said body member having a chamber open to the side of the body member, said mouth communicating directly with said chamber, and said second edge being at a side of said chamber and spaced from the first mentioned edge so that an inhalation air stream does not excite said second mentioned edge.

11. A reedless musical wind instrument comprising a body member including a harmonica-like mouthpiece having aligned wind hole openings, said body member having a resonator pipe and a sharp edge at the mouth of said pipe, said body member having a wind channel leading through said mouthpiece from each of said wind hole openings and terminating adjacent said sharp edge, said body member having a chamber communicating with the mouth of said pipe, and a second resonator pipe having a sharp edge disposed in communication with said chamber and spaced a considerable distance from the first mentioned sharp edge, so that air blown into said wind hole opening will strike the second mentioned edge as a columnated air jet, while air inspired by the player through said wind hole opening bends sharply around the first mentioned edge to excite the same without excitation of the second mentioned edge, whereby musical tones may be produced according to the character of the resonator pipes.

12. In a musical instrument of the harmonica type having a mouthpiece pierced with a plurality of aligned openings and each opening communicating with a pair of reedless, open mouthed, musical resonator pipes; a confining canal beginning at an opening in said mouthpiece and terminating abruptly in the close vicinity of the open mouth of one resonator pipe; said canal terminating in a sharp edge formed by the sharp intersection of an inner surface of said canal and another surface fully exposed to the outside atmosphere; another separate resonator pipe having its own fully open and discreet mouth; a second sharp edge disposed close to the second mentioned mouth and spaced farther than the first mentioned mouth from the first mentioned sharp edge; said second sharp edge pointing toward the first mentioned sharp edge, so that said second sharp edge will be struck by air as an exciting jet only when air is exhaled by the player, and air in seeking the shortest path will bend sharply around the first mentioned sharp edge near the mouth of the first mentioned resonator pipe when the player inhales and so that without hindrance from valves, the player can exclusively excite the first mentioned resonator pipe by inhalation and can exclusively excite the second mentioned resonator pipe by exhaling through the same mouthpiece opening.

13. In a musical instrument of the harmonica type having a mouthpiece pierced with a plurality of aligned openings and each opening communicating with a pair of reedless, open mouthed, musical resonator pipes; a confining canal beginning at an opening in said mouthpiece and terminating abruptly in the close vicinity of

the open mouth of one resonator pipe; said canal terminating abruptly in a sharp edge formed by the sharp intersection of an inner surface of said canal and a surface lying outside of said one resonator pipe and lying outside of the canal; another separate resonator pipe having its own fully open and discreet mouth; a second sharp edge disposed close to the second mentioned mouth and spaced farther than the first mentioned mouth from the first mentioned sharp edge; said second sharp edge pointing toward the first mentioned sharp edge, so that said second sharp edge will be struck by air as an exciting jet only when air is exhaled by the player, and air in seeking the shortest path will bend sharply around the first mentioned sharp edge near the mouth of the first mentioned resonator pipe when the player inhales and so that, without hindrance from valves, the player can exclusively excite the first mentioned resonator pipe by inhalation and can exclusively excite the second mentioned resonator pipe by exhaling through the same mouthpiece opening.

14. Apparatus according to claim 13, wherein the first mentioned sharp edge is the only sharp edge adjacent the first mentioned mouth, so that the area opposite the first mentioned mouth is free of sharp edges, thus allowing wind to leave the vicinity of the first mentioned mouth quietly.

15. A musical wind instrument comprising a mouthpiece having a plurality of aligned openings; a short canal leading from each of said openings and terminating abruptly in a knife edge; a musical resonator pipe in the immediate vicinity of said knife edge; said edge pointing away from said canal; a blunt edge on the side of the mouth of said resonator pipe; said canal pointing toward said blunt edge; another musical resonator pipe

having a sharp edge at its mouth; the second mentioned mouth and last mentioned edge being out of contact with the first mentioned mouth and edge; the second mentioned mouth being on the side of the first mentioned mouth remote from said canal and on the side of said blunt edge remote from said canal, so that the operator can excite exclusively the first mentioned resonator pipe by inhaling at the mouthpiece opening and can excite exclusively the second resonator pipe by exhaling into the same mouthpiece opening entirely by virtue of the sequential arrangement of said mouths and edges without the use of hindering valves.

16. An apparatus according to claim 8 and wherein said deflector constitutes the only structure opposite the inner end of said canal and said deflector having a smooth surface.

17. An apparatus according to claim 13 and wherein the portion of the first mentioned mouth opposite the inner end of said canal is smooth.

References Cited in the file of this patent

UNITED STATES PATENTS

192,061	Fogelberg	June 18, 1877
532,642	Crowell	Jan. 15, 1895
780,674	Leech	Jan. 24, 1905
797,232	Schwarz	Aug. 15, 1905
1,688,349	Petrie	Oct. 23, 1928
1,744,570	Paget	Jan. 21, 1930
2,496,134	Scully	Jan. 31, 1950
2,506,039	Sivitz	May 2, 1950

FOREIGN PATENTS

370,684	France	Feb. 16, 1907
---------	--------	---------------