March 3, 1942. H. HORNE 2,274,897

MUSICAL INSTRUMENT

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FIG. 1

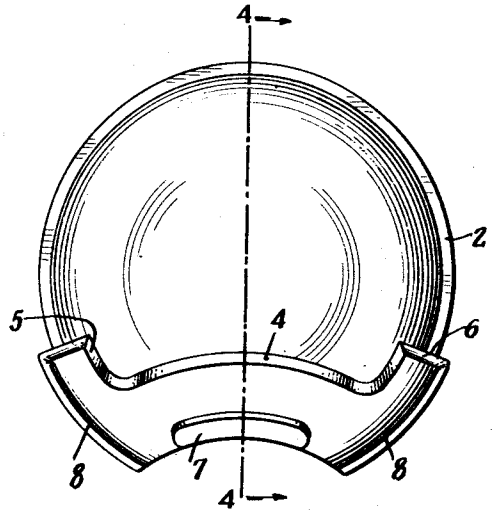


FIG. 2

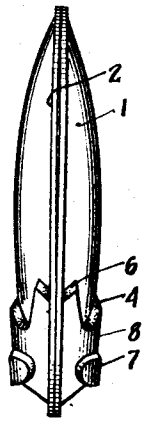


FIG. 4

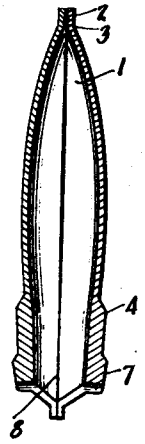


FIG. 6

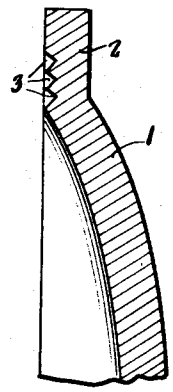


FIG. 3

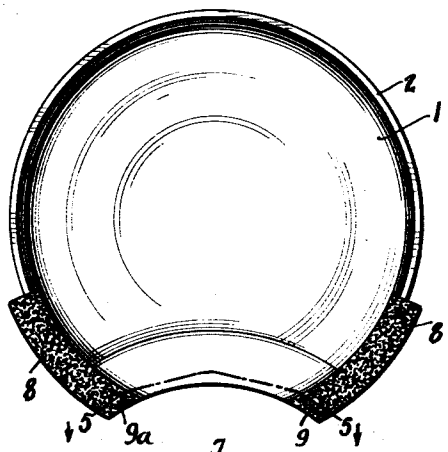
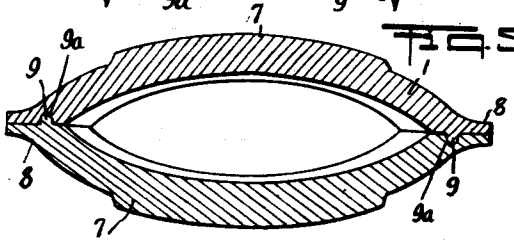


FIG. 5



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Mock & Blum
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Fig. 7

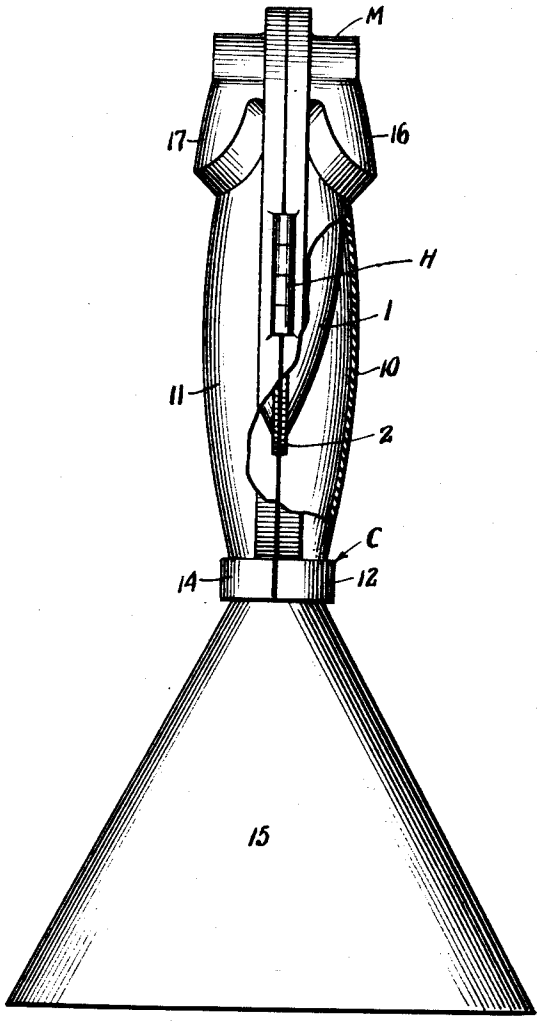


Fig. 8

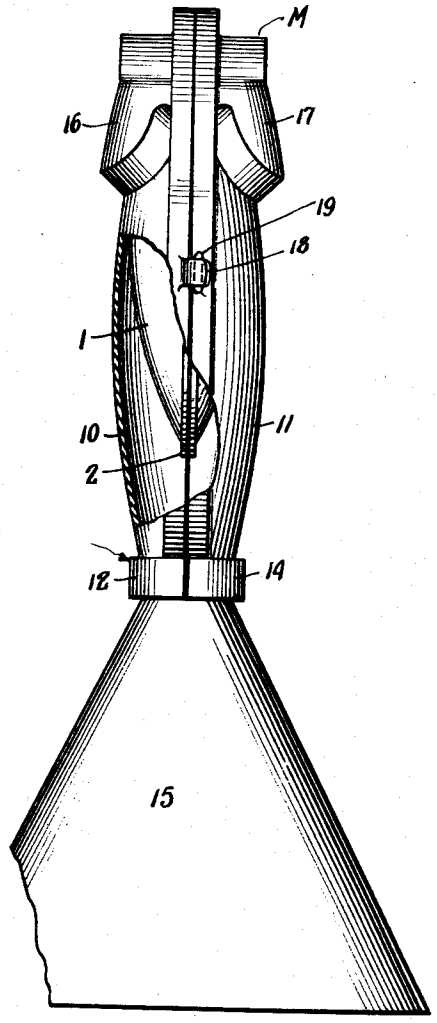
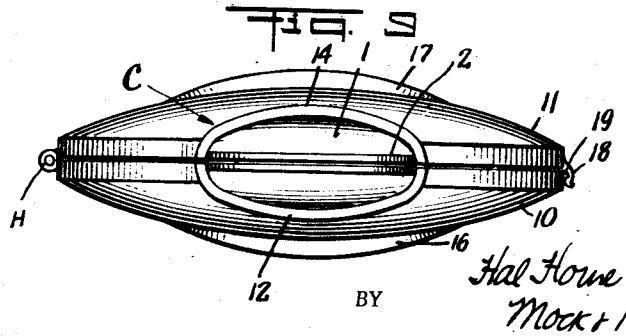


Fig. 9



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MUSICAL INSTRUMENT

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Fig. 10

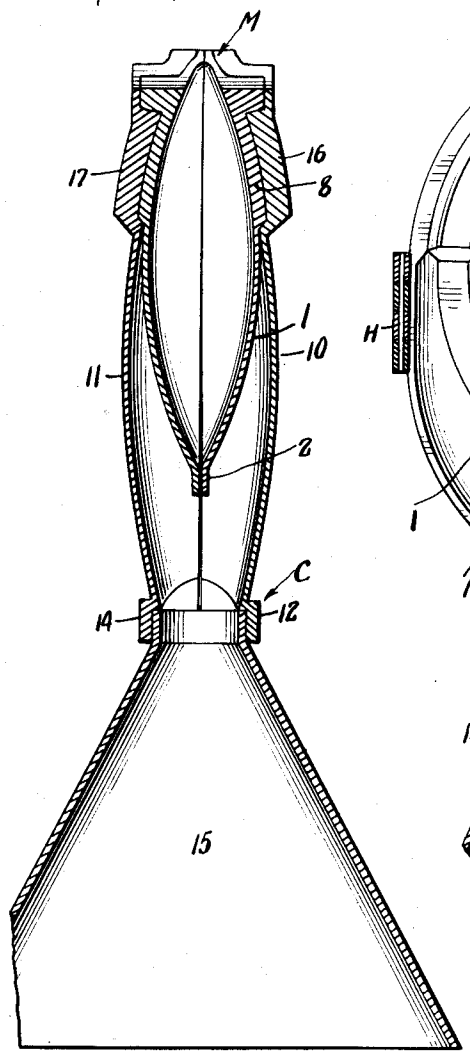

Fig. 11

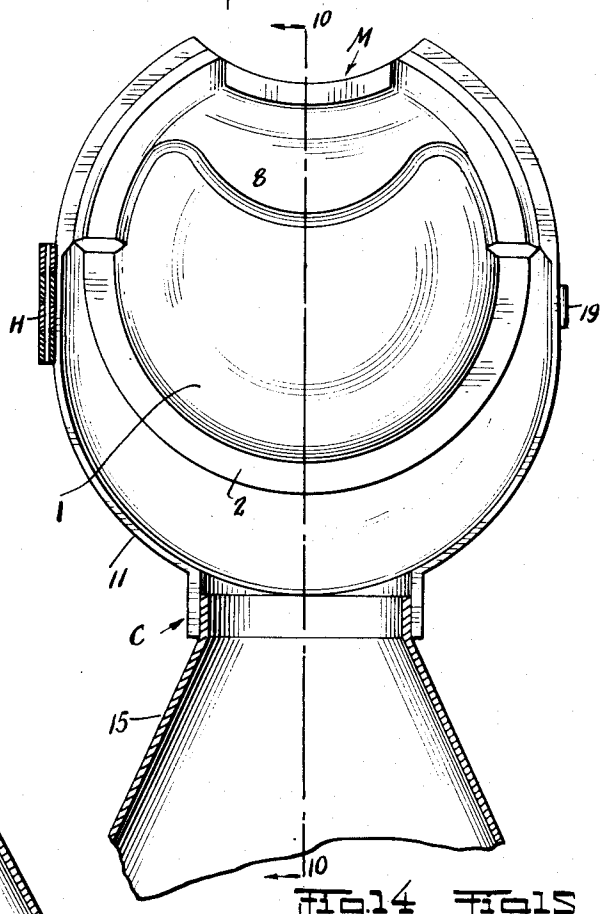

Fig. 12

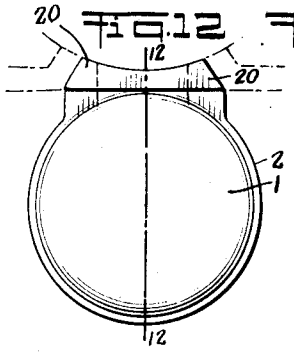

Fig. 13

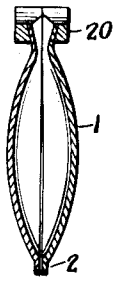

Fig. 14

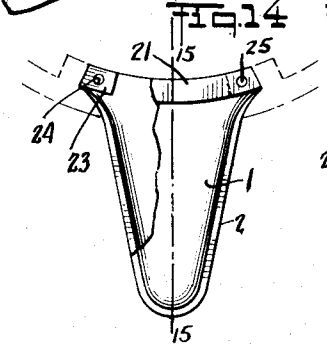

Fig. 15

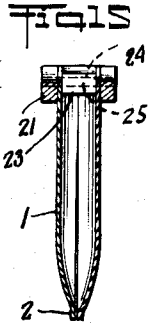

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Fig. 16

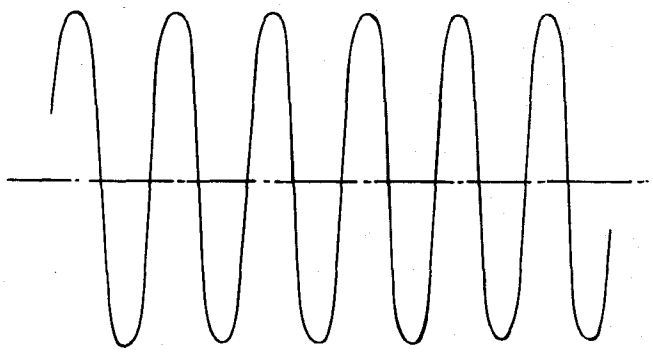

Fig. 17

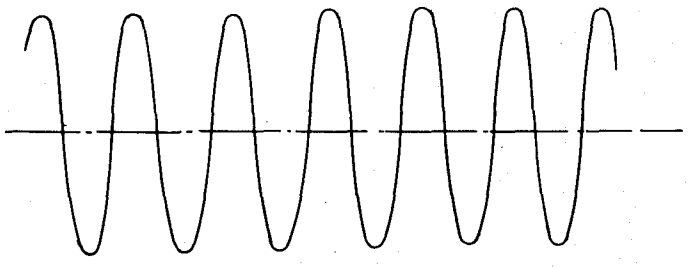

Fig. 18

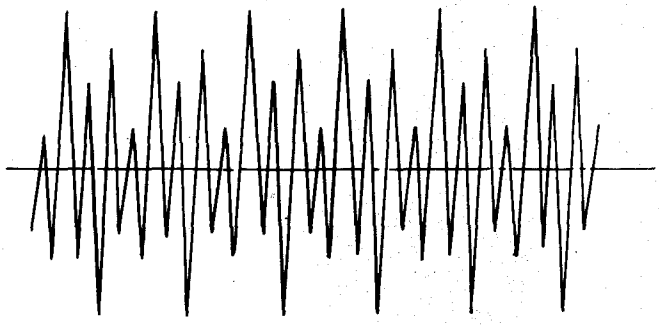

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Fig. 19

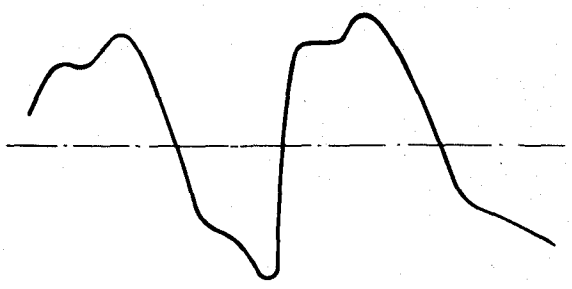


Fig. 20

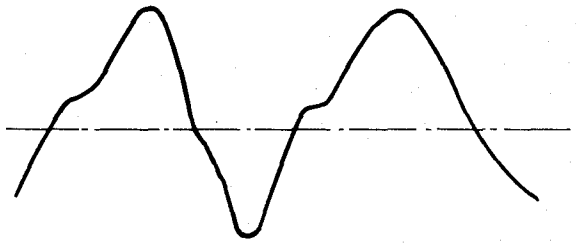
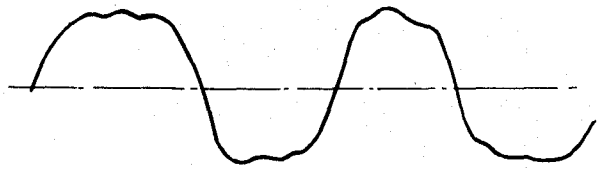


Fig. 21



INVENTOR.

Hal Horne

BY Mock & Blum

ATTORNEYS

Patented Mar. 3, 1942 2,274,897

UNITED STATES PATENT OFFICE

2,274,897

MUSICAL INSTRUMENT

Hal Horne, New York, N. Y., assignor to Kershaw Burbank, doing business as Sing-A-Tina Studio, New York, N. Y.

Application July 2, 1941, Serial No. 400,791

8 Claims. (Cl. 46—178)

My invention relates to a new and improved musical instrument.

One of the objects of my invention is to provide a musical instrument which is preferably made of non-metallic material and into which the player can sing while the lips of the player enclose the lip-portions of the instrument, so that the instrument acts as an extension of the cavity of the player's mouth.

Another object of the invention is to provide a device of this type which can be easily and cheaply manufactured and assembled, and which can be easily played even by an inexperienced person.

Another object of the invention is to provide a hollow instrument which consists of a plurality of body members, preferably two body members being used. These body members are made of resonant material, and they are rigidly connected to each other only at the lip portions of the instrument. Said body members contact separably at the remaining portions of said body members. By making said body members of resonant material, numerous overtones or harmonics are developed when a simple sound is sent into the opening of the instrument. Likewise, various unique overtones and tonal effects are secured by a simple fingering of the instrument and by regulated finger pressure on its resonant body members.

Another object of the invention is to provide the separable edges of the body members with grooved flanges, the edges of said grooves normally contacting.

Another object of the invention is to combine said instrument with a surrounding resonator or amplifier. Said amplifier may be of the exponential horn type, so that the instrument can be used in a band to get unique effects with large volume.

Other objects of the invention will be set forth in the annexed description and drawings, which describe certain embodiments thereof.

Fig. 1 is a top plan view of the first embodiment of the improved device.

Fig. 2 is an end view of Fig. 1.

Fig. 3 is an inner plan view of one of the body members of the device. In this embodiment, the device is made of two identical body members.

Fig. 4 is a sectional view on the line 4—4 of Fig. 1.

Fig. 5 is a sectional view on the line 5—5 of Fig. 3 and it also shows the body member which is complementary to the body member which is illustrated in Fig. 3.

Fig. 6 is a detail sectional view on a greatly enlarged scale, showing the grooves which are formed in the flange of the device.

Fig. 7 is a front elevation of a second embodiment of the invention, in which the improved instrument is combined with an amplifier.

Fig. 8 is a rear elevation of Fig. 7.

Fig. 9 is an end elevation at the outlet end of the outer casing of the instrument which is shown in Figs. 7 and 8, with the horn 15 removed.

Fig. 10 is a section on the line 10—10 of Fig. 11, save that the upper part of the instrument, which is within the outer casing, is shown in elevation.

Fig. 11 is an inner side elevation of the instrument which is shown in Figs. 7–10.

Fig. 12 is a front elevation of a third embodiment, in which the body members or shells are made of metal, instead of being made of a resin.

Fig. 13 is a section on the line 12—12 of Fig. 12.

Fig. 14 is an elevation of a fourth embodiment of the invention, part of the representation of one of the body members having been omitted. In this embodiment, the body members are made of metal.

Fig. 15 is a section on the line 15—15 of Fig. 14.

Fig. 16 is an oscillograph of a pure tone whose frequency is one kilocycle.

Fig. 17 is an oscillograph of the sound wave which is emitted by a comparison musical device which is not made according to the invention, but which is made of two partially connected body members, illustrating the slight production of harmonics by such device.

Fig. 18 is an oscillograph of the sound wave which is emitted by my improved device, when a pure sound wave whose frequency is one kilocycle is fed therein, this being the same sound wave which is illustrated in Fig. 16.

Fig. 19 is the oscillograph of another test sound wave whose frequency is 500 cycles per second.

Fig. 20 shows the sound wave which is emitted by said comparison instrument, when it is supplied with the sound wave which is illustrated in Fig. 19.

Fig. 21 is an oscillograph which illustrates the modified sound wave which is emitted by the improved instrument, when it is supplied with the sound wave which is illustrated in Fig. 19.

The first embodiment of the device comprises two identical members or shells 1, which are preferably made of polystyrene resin or of any other suitable thermoplastic molding material, such as cellulose acetate or the like. Polystyrene resin is made by polymerizing styrene or vinyl benzene.

The major portion of each shell 1 is of concavo-convex contour, with the concave wall facing inwardly in the assembled device. Each shell is provided with a planar flange 2 which extends around the major portion of the body of the respective shell up to the lip flanges 8. Each flange 2 is provided with one or more grooves 3. These grooves 3 may have the angular cross-section which is shown in Fig. 6, or a cross-section of any other desired shape.

When the shells are assembled, the sharp edges or apices of these grooves substantially abut each other, thus providing curved recesses which extend up to the lip flanges 8. The thickness of the outwardly extending lip flanges 8 greatly exceeds the thickness of the major portion of the wall of each shell.

The thickness of the wall of each shell 1, with the exception of the flanges 8, is from .022 of an inch–.025 of an inch, if the shells are made of polystyrene resin or of cellulose acetate. Of course, there may be some variations in the thickness of the wall of the cup-shaped part of the shell, and parts of said wall may have a thickness as low as .018 of an inch.

Each lip flange 8 is provided with an inner upstanding edge 4, whose outline is convex, and which is integral with substantially straight end edge-portions 5. The lateral edge-portions 6 of the lip flange 8 are substantially planar and perpendicular to the edge-portions 5. The front of each lip-flange 8 is provided with an upstanding rib or projection 7, which extends to the inlet edge of the respective lip-flange. The abutting or inward faces of the flanges 8 are substantially planar. The inward faces of each lip-flange 8 are provided respectively with a pin-shaped projection 9 and with a corresponding recess 9a as shown in Fig. 5, to aid in the assembly of the shells. This assembly is completed by means of any suitable adhesive which is applied to the inward faces of the flanges 8.

The flanges 2 are preferably unconnected, so that after the shells have been connected to each other at the inner faces of the lip flanges 8, the flanges 2 of the resilient shells 1 can be separated by moderate lateral pressure which is parallel to the plane of the paper of Fig. 1. The extent of this separation depends upon the amount of said lateral pressure, and such lateral pressure will produce a greater separation between the flanges 2 at the outer ends of the shells than at the lip ends of the unconnected parts of the shells.

In utilizing the instrument, the rigid flanges 8 are held between the lips of the user, which enclose said flanges. These flanges 8 are made sufficiently rigid to take up the pressure of the lips, so that the main bodies of the shells 1 are free to vibrate and the flanges 2 are free to separate slightly under the air which is forced into the interior of the device. Unique effects and changes in the pitch of the tone which is emitted, can also be secured by applying lateral pressure in varying degree to the shells, and also by applying perpendicular pressure to the shells, by means of the fingers of the player. The pitch and quality of the emitted sound can thus be effectively controlled within substantial limits.

The grooves 3 eliminate the clacking sound which would otherwise be produced if the inner faces of the flanges 2 were flat and made substantial planar contact with each other. Air can be forced out of the instrument, between the flanges 2, by the use of very moderate pressure.

While I do not exclude the use of metal, I prefer to use thin shells which are made of more sonorous material than metal, and I have found the use of polystyrene resin very effective because the resonance of this material causes the shells to resonate so as to produce rich overtones. Cellulose acetate is also effective for producing rich overtones. Such connection may be designated as an air-tight connection. The air-tight connection can be secured by means of adhesive, as previously described.

It is preferable not to use adhesive to connect the inner faces of the flanges 8 because the cement will form an additional layer of material. It is therefore preferred to apply a softening or solvent liquid to the inner faces of the flanges 8 and then to connect said softened inner faces by suitable pressure, without the use of heat. This produces an autogenous joint which is free from any cement. Liquids of this type are well known for use in connecting members which are made of polystyrene, cellulose acetate, etc.

Fig. 18 and Fig. 21 illustrates the rich overtones which are produced by the improved instrument which is shown in Figs. 1–6 inclusive, when said instrument is supplied with pure sound waves which have respective frequencies of 1000 cycles per second and 500 cycles per second.

Figs. 17 and 20 illustrate the relatively very slight modification of the same respective sound waves by a comparison instrument which is made of substantially non-sonorous metal, and which does not have the improved construction illustrated herein.

The embodiment of Figs. 7–11 inclusive comprise s supplemental casing which is made of two shells 10 and 11. These shells can be made of any suitable resin or metal. Said shells are connected by a hinge H. The shell 11 is provided with a locking projection 19 and the shell 10 is provided with a resilient latch 18 by the use of which the shells 10 and 11 can be held closed. This supplemental casing is provided with a collar C at one end thereof. Said collar C comprises collar sections 12 and 14 which are respectively integral with the body members or shells 10 and 11. When this supplemental casing is closed, the closed collar C tightly grips the mouth of a horn 15, which may be an exponential horn or of any other type. A resonant musical instrument of the type which is shown in the preceding embodiment, is held clamped at the inlet end of the supplemental casing, said supplemental casing is provided with a mouth opening which has a wall M, as shown in Fig. 10. The inner musical instrument may be held clamped by the supplemental casing, or said inner musical instrument can be connected to one of the halves of the supplemental casing. This device will operate with greater volume, with or without the horn 15, and it will produce the same effects as the instrument which is shown in Figs. 1–5.

In the embodiment of Figs. 12 and 13, the shells 1 are made of metal. The shells 1 are connected by soldering or in any other suitable manner to the inner wall of a mouth piece 20. This mouth piece 20 can be clamped in any suitable supplemental casing, as indicated by the broken lines in Fig. 12.

In the embodiment of Figs. 14 and 15, the shells are also made of metal and the configuration of the shells is different from that shown in the preceding embodiments. The tips of the respective shells 1 are connected to a metal mouth piece 21 by means of rivets or other fastening means 25 which pass through bores 24 of filler blocks 23,

said filler blocks 23 being located between the corners of the inner walls of the shells 1.

When the shells are made of metal, said metal should be resilient so that the shells can vibrate when a sound wave is sent through the instrument.

The major portions of the edges of the shells are movable relative to each other, in all of the embodiments. For example, in the first embodiment, the major portions of the edges of the shells are free to move relative to each other and the portions of the edges of the shells which are connected to each other may be as low as 20%–30% of the entire length of the edge of the instrument. In particular, the edges of the shells are free to move relative to each other, under the action of a sound wave, at the zone which is opposed to the mouth opening. The casing of the instrument is substantially normally closed, so that the resilient parts of the casing will vibrate when an incoming sound wave is sent into the interior of the casing through the mouth opening, and a sound wave is emitted from said casing between the unconnected portions of the edges of the members of said casing.

When the device is played, the lips of the player are located behind the upstanding lugs or projections 7. Since the mouth flanges 8 are sufficiently rigid to prevent any substantial vibration thereof, the vibration of the main bodies of the shells is not transmitted to the mouth of the player, which is a decided advantage, because such vibration would be very disagreeable.

I have disclosed preferred embodiments of my invention, but it is clear that numerous changes and omissions can be made without departing from its spirit.

A comparison between Figs. 16 and 18 shows that when the instrument which is made of polystyrene resin, is supplied with an incoming sound wave whose frequency is 1000 cycles per second, the emitted wave which is illustrated in Fig. 18, has a frequency which is at least three times the frequency of the incoming wave.

I claim:

1. A musical instrument comprising a hollow casing which has a mouth opening and which is substantially closed save at said mouth opening, said casing consisting of a pair of substantially identical dished and resilient shells which have respective lateral peripheral flanges, said flanges having lateral enlargements adjacent said mouth opening, said shells being connected to each other only at said lateral enlargements, the shells being thicker at said lateral enlargements than at the other portions of said shells to provide a mouthpiece of greater rigidity than the other portions of said shells, said flanges being separable save at said lateral enlargements, said flanges having grooves, the edges of the grooves of the respective flanges substantially abutting each other in the normal positions of the shells, the vibration of said shells under the action of an incoming sound wave which enters the casing through said mouth opening, producing an emitted sound wave which is different from said incoming sound wave.

2. A device according to claim 1 in which said shells are made from a class of materials which consists of polystyrene and cellulose acetate.

3. A musical device comprising an outer casing which has a mouth opening and an outlet end, said outer casing having an amplifier horn connected thereto at its outlet end, said casing having a hollow musical instrument located therein, said musical instrument having a mouth opening which is in registration with the first-mentioned mouth opening, a part of the outer wall of said musical instrument, which is adjacent the mouth opening thereof, abutting the inner wall of the outer casing, substantially all the rest of said hollow musical instrument having separable and substantially abutting edges which are substantially aligned with said outlet end, the wall of said musical instrument being resilient so that when a sound wave is sent into the interior of said musical instrument through said registering mouth openings, said musical instrument emits a modified sound wave between its separable edges into said amplifier.

4. A musical instrument comprising a casing which has an inlet opening, said casing comprising a plurality of resilient members which have adjacent edges, said edges having connected portions which have a fixed and air-tight connection to each other, said connected portions holding said resilient members fixed to each other in permanent relative position, said edges also having other portions which are unconnected to each other and which are free to vibrate relative to each other so that an emitted sound wave passes out of said casing between said unconnected portions when an incoming sound wave is supplied to the interior of said casing through said inlet opening, said members being sufficiently resilient and said unconnected portions being normally sufficiently close to each other so that said resilient members are vibrated under the action of an incoming sound wave which enters said casing through said inlet opening, the self-vibration of said resilient members under the action of said incoming sound wave modifying said incoming sound wave so that said emitted sound wave is different from the incoming sound wave, an outer casing in which said musical instrument is located, said outer casing having a casing inlet opening and a casing outlet opening, said casing inlet opening being in registration with said inlet opening of said instrument, said casing outlet opening being in registration with said other portions of said edges, portions of the walls of said musical instrument which are located adjacent said inlet opening of the musical instrument being fixed to the inner wall of said casing, said other portions of said edges being spaced from and being free to vibrate relative to the wall of said casing.

5. A musical instrument comprising a casing having an inlet opening, said casing comprising a pair of resilient sections having edges of similar contour disposed in substantially abutting relation, said edges being fixedly secured together in an air tight connection at each side of the inlet opening and for a substantial distance away from each side of the inlet opening to maintain the casing sections in permanent position relative to each other, the remainder and greater portion of said edges being unconnected and free to vibrate relative to each other so that an emitted sound wave passes out of said casing between the unconnected portions when an incoming sound wave passes into said casing through said inlet opening, the casing sections being sufficiently resilient and said unconnected portions being normally sufficiently close to each other so that the resilient sections will be vibrated under the action of an incoming sound wave to modify the sound wave as it passes through the instrument.

6. A musical instrument comprising a casing made from polystrene resin and having an inlet opening, said casing comprising a pair of resilient sections having edges of similar contour disposed in substantially abutting relation, said edges being fixedly secured together in an air tight connection at each side of the inlet opening and for a substantial distance away from each side of the inlet opening to maintain the casing sections in permanent position relative to each other, the remainder and greater portion of said edges being unconnected and free to vibrate relative to each other so that an emitted sound wave passes out of said casing between the unconnected portions when an incoming sound wave passes into said casing through said inlet opening, the casing sections being sufficiently resilient and said unconnected portions being normally sufficiently close to each other so that the resilient sections will be vibrated under the action of an incoming sound wave to modify the sound wave as it passes through the instrument, the passage of said sound wave through the instrument being unrestricted except by the resilient walls and unconnected edges of said sections.

7. A musical instrument comprising a casing having an inlet opening, said casing comprising a pair of resilient sections having edges of similar contour disposed in substantially abutting relation, said edges being fixedly secured together in an air tight connection at each side of the inlet opening and for a substantial distance away from each side of the inlet opening to maintain the casing sections in permanent position relative to each other, the remainder and greater portion of said edges being unconnected and free to vibrate relative to each other so that an emitted sound wave passes out of said casing between the unconnected portions when an incoming sound wave passes into said casing through said inlet opening, the casing sections being sufficiently resilient and said unconnected portions being normally sufficiently close to each other so that the resilient sections will be vibrated under the action of an incoming sound wave to modify the sound wave as it passes through the instrument, the connected portions of said resilient sections being relatively rigid in comparison with the resilient unconnected portions.

8. A musical instrument comprising a casing having an inlet opening, said casing comprising a pair of resilient sections having edges of similar contour disposed in substantially abutting relation, said edges being fixedly secured together in an air tight connection at each side of the inlet opening and for a substantial distance away from each side of the inlet opening to maintain the casing sections in permanent position relative to each other, the remainder and greater portions of said edges being unconnected and free to vibrate relative to each other so that an emitted sound wave passes out of said casing between the unconnected portions when an incoming sound wave passes into said casing through said inlet opening, the casing sections being sufficiently resilient and said unconnected portions being normally sufficiently close to each other so that the resilient sections will be vibrated under the action of an incoming sound wave to modify the sound wave as it passes through the instrument, said resilient casing sections being made from a class of material consisting of polystyrene and cellulose acetate.

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