W. N. DENNISON.

SOUND BOX.

APPLICATION FILED AUG. 30, 1907.

1,165,395.

Patented Dec. 28, 1915.

2 SHEETS—SHEET 1.

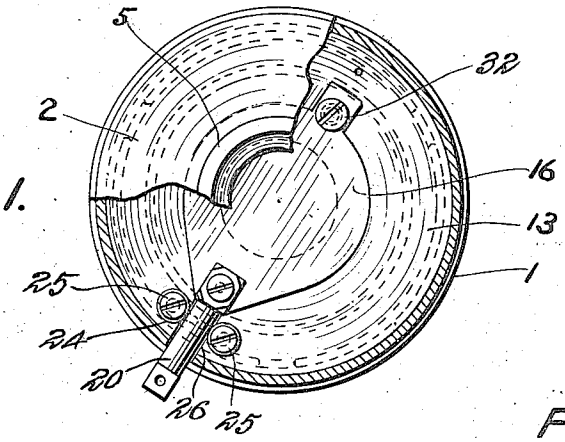


FIG. 1.

FIG. 2.

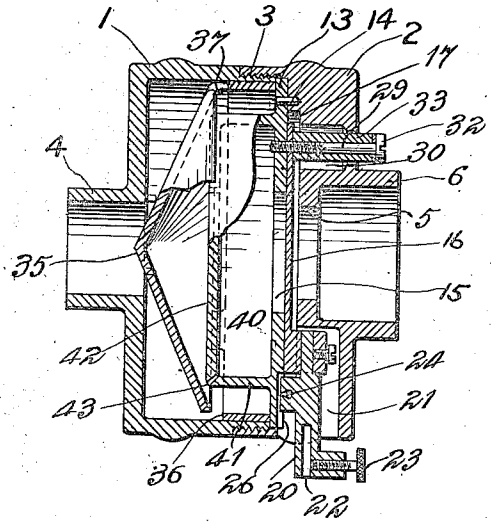
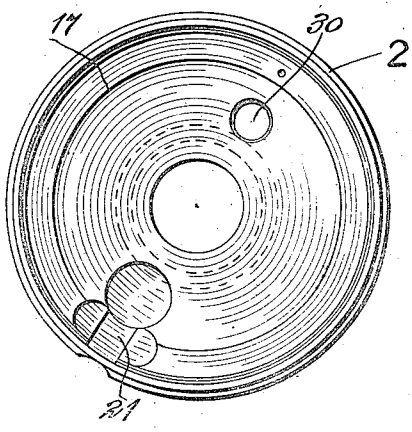


FIG. 4.



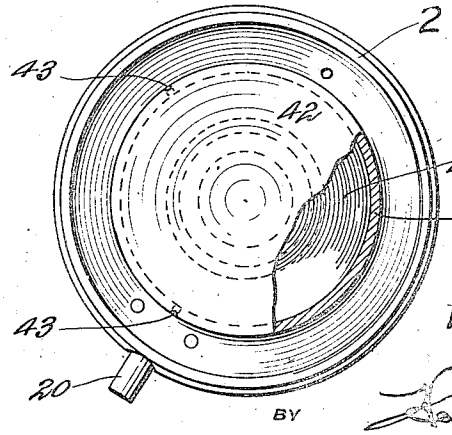


FIG. 3.

WITNESSES

A. J. Hartman

A. J. Gardner.

INVENTOR

Wilburn N. Dennison.

BY

ATTORNEY

W. N. DENNISON.

SOUND BOX.

APPLICATION FILED AUG. 30, 1907.

1,165,395.

Patented Dec. 28, 1915.

2 SHEETS—SHEET 2.

FIG. 8.

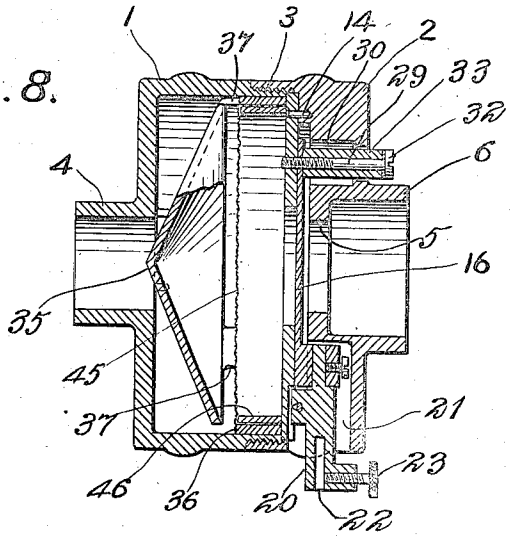


FIG. 5.

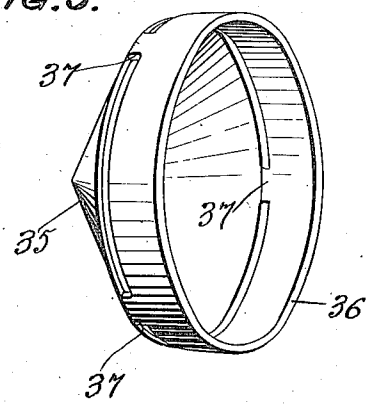


FIG. 6.

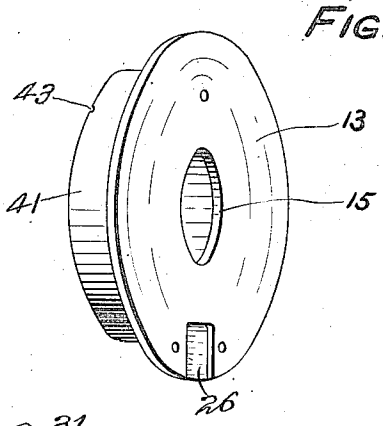
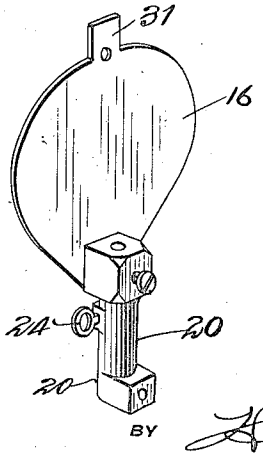


FIG. 7.



INVENTOR

Wilburn N. Dennison.

WITNESSES

H. J. Hartman.

A. B. Gardner.

BY

Horace Pettit

ATTORNEY

UNITED STATES PATENT OFFICE.

WILBURN N. DENNISON, OF MERCHANTVILLE BOROUGH, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SOUND-BOX.

1,165,395. Specification of Letters Patent. Patented Dec. 28, 1915.

Application filed August 30, 1907. Serial No. 390,741.

To all whom it may concern:

Be it known that I, WILBURN N. DENNISON, a citizen of the United States, and a resident of the borough of Merchantville, State of New Jersey, have invented certain new and useful Improvements in Sound-Boxes, of which the following is a specification.

The main objects of this invention are to provide an improved pneumatic sound box; to provide in a pneumatic sound box, an improved valve and means for cushioning the same; to provide in a pneumatic sound box improved means for distributing the fluid current; and to provide other improvements as will appear hereinafter.

In the accompanying drawings Figure 1 is a fragmentary front elevation of a sound box constructed in accordance with this invention; Fig. 2 is an inside elevation of a portion of the same; Fig. 3 is a fragmentary interior elevation of a portion of the same; Fig. 4 is a fragmentary longitudinal central section of the sound box; Figs. 5, 6 and 7 are perspective views of details of the same; and Fig. 8 is a fragmentary longitudinal central section of a modified form of sound box constructed in accordance with this invention.

Referring to the drawings one embodiment of this invention comprises a sound box including a hollow substantially cylindrical casing consisting of coaxial sections, a relatively long inner or inlet section 1 and a relatively short outer or outlet section 2, the inner ends of which are screw threaded together as at 3, The inner section 1 is provided with a tubular extension 4 coaxial therewith and forming a tubular inlet for the sound box. The outer section 2 is provided with a central substantially circular aperture 5, forming an outlet for the sound box, and with a corresponding tubular extension 6 coaxial with the outlet 5 and of greater internal diameter than the diameter of the outlet.

For controlling the flow of a current of air or other fluid in the sound box, a circular flat plate 13, forming a valve seat, is arranged within the casing and coaxially therewith, dividing the casing into two compartments. The marginal portion of this plate 13 is securely clamped between the two sections 1 and 2 of the casing in an annular internal groove provided therefor between these sections, and this plate 13 is positioned by means of a pin 14 extending through the marginal portion of the plate and into the inner surface of the outlet section 2 of the casing. This plate or valve seat 13 is provided with a centrally arranged substantially circular opening 15 forming a valve port which is preferably of a greater diameter, than the diameter of the outlet 5 for a purpose that will appear hereinafter.

For impressing sound waves upon a fluid current passing through the valve port 15, a relatively thin, normally flat flexible valve 16 is arranged between the valve seat 13 and the outer section 2 of the casing, and normally rests flat against the valve seat 13. This valve 16 engages freely in, and nearly fills, a correspondingly shallow circular internal recess 17 provided therefor in the inner wall of the outer section 2 of the casing and coaxial therewith. The central and major portion of this valve is imperforate and is approximately circular in outline and is substantially concentric with the valve port 15 and of a diameter appreciably greater than the diameter of the valve port 15. For vibrating and flexing the valve 16 in accordance with a sound record, the lower portion of the valve is slightly extended and is rigidly secured to the upper end of a stylus bar 20 which projects downwardly freely through an aperture 21 provided therefor through the lower side of the outer section 2 of the sound box casing, and the lower end of which is provided with the usual socket 22 adapted to hold a stylus (not shown) and with the usual set screw 23 for holding the stylus in position. This stylus bar is supported for oscillation upon a flexible connection 24 which extends transversely through the stylus bar approximately in a plane with the outer surface of the valve seat 13. The ends of the connection 24 are secured to the valve seat 13 by screws 25 and the lower portion of the outer face of the valve seat 13 is recessed as at 26 to permit of the free oscillation or vibration of the stylus bar about the flexible connection 24.

For holding the valve 16 normally flat against its seat 13, the upper portion of the valve is yieldingly held against the seat by a screw 29 which is parallel to the longitudinal axis of the sound box and passes loosely through an aperture 30 provided therefor in the outer section 2 of the casing, and loosely

through an extension 31 provided on the valve diametrically opposite the stylus bar. The outer end of the screw 29 is provided with a head 32 and the inner end of the screw is threaded snugly through the valve seat 13. Surrounding the screw 29 is a sleeve 33 made of rubber or other similar resilient material which is adjustably clamped between the head 32 of the screw 29 and the outer surface of the valve 16 and normally presses the valve flat against its seat. It is believed that improved results are obtained by the use of this yielding connection and these results are thought to be due to the fact that under the combined action of the stylus bar and the yielding connection, the valve is flexed diametrically at the beginning of each oscillation of the stylus bar, and begins the opening or closing of the valve port in a diametrical region of the port and continues the opening or closing of the port uniformly in opposite directions from the diametrical region. This yielding connection may however be omitted and good results may still be obtained.

For spreading the fluid current as it enters the casing through the inlet 4, a conical deflector or spreader 35 is arranged within and coaxial with the inner section 1 of the casing and with its apex projecting slightly within the inlet 4 and its sides flaring or diverging outwardly. The edge or marginal portion of this deflector is spaced from the inner cylindrical surface of the inner section 1 of the casing and the deflector is supported by a cylindrical ring 36 which is arranged between the deflector and the valve seat 13, and which fits tightly within the inner section 1 of the casing, and with its outer edge in contact with the inner surface of the valve seat 13. The deflector 35 is held with its edges spaced slightly away from the inner edge of the ring 36 by means of relatively narrow strips 37 arranged at intervals around, and projecting from the edge of the deflector and connecting the edge of the deflector with the inner edge of the ring 36, the deflector 35, strips 37, and ring 36 being either integral one with each of the others, as shown, or constructed of separate pieces secured together in any suitable manner.

For receiving the fluid current after it has been subjected to the action of the spreader 35 and for delivering the current to the valve port 15 under substantially uniform pressure throughout the entire area of the port, a substantially cylindrical cup or closure 40 is arranged within the casing, and coaxially therewith, between the conical deflector 35 and the valve seat 13. This cup comprises a cylindrical wall 41 and a flat circular wall 42, the cylindrical wall being secured to and projecting inwardly from the valve seat 13 and the flat circular wall 42 being parallel to the valve seat 13 and marginally connected in a circular region to the inner margin of the cylindrical wall. The external diameter of the cylindrical wall 41 is preferably somewhat less than the diameter of the deflector 35 and the flat circular wall 42 is preferably arranged approximately in the plane of the edge of the deflector, the walls of the cup being spaced slightly from the deflector. The walls of the cup are imperforate except for a series of spaced, relatively small apertures 43, which are provided through the circular region of connection between the cylindrical wall 41 and the flat wall 42. Preferably but three of these apertures 43 are used and these converge inwardly toward the outlet 5 of the sound box. The arrangement of the apertures 43 is such that it is necessary for the fluid current to pass around the edge of the deflector and to reverse its direction of flow before being admitted into the interior of the cup 40.

As shown in Fig. 8, the hereinbefore described construction may be modified by omitting the hereinbefore described cup 40 and substituting a diaphragm 45 of silk or other similar foraminous material stretched across the interior of the casing, the edge of the diaphragm being turned forwardly in a cylindrical flange and being clamped against the inner surface of the ring, supporting the deflector, by an inner ring 46.

When in operation, this improved sound box is ordinarily supported in a well known manner to coöperate with a sound record, the tubular inlet 4 of the sound box being arranged in communication with any suitable source for supplying the sound box with compressed air and the outlet 5 of the sound box being arranged to communicate with a horn or sound amplifier. The air or other fluid current is spread outwardly in the sound box by the deflector or spreader and is then distributed either through the apertures 43 of the cup 40, or through the foraminous diaphragm 45, as the case may be, to the valve port 15. As the fluid presses through the port 15 it is acted upon by the flexible valve 16, which impresses undulations corresponding to sound waves upon the current, and as the central and major portion of the valve is approximately circular, and appreciably of greater diameter than the valve port the valve deflects all of the current and causes it to flow around the margin of the valve, and, as the outlet 5 is of less diameter than the diameter of the valve, substantially all of the current is deflected by the inner surface of the outer section 2 of the casing and is caused to pass through the narrow space or trap between this surface and the surface of the valve to cushion the valve and is then permitted to pass out through the outlet 5.

Although only two forms have been shown in which this invention may be embodied, it is to be understood that the invention is not limited in its application to any specific construction but might be applied in various forms without departing from the spirit of the invention or the scope of the appended claims.

Having thus fully described my invention what I claim and desire to protect by Letters Patent of the United States is:

1. A sound box comprising a hollow casing having an inlet at one end and an outlet at the opposite end, a plate between said ends dividing the interior of the box into two compartments and provided with a valve port, a valve mounted to vibrate over said port, means to vibrate said valve in accordance with a sound record, and a cup forming a chamber over said valve port and having apertures adjacent the peripheral edge only of said chamber to admit a fluid current.

2. A sound box comprising a hollow casing provided with an inlet at one end and an outlet at the opposite end, a plate between said ends dividing the interior of the box into compartments, a side of said plate being in close proximity to the inner surface of the end of said box and forming an air trap, surrounding said outlet, said plate being provided with a central aperture forming a valve port, an imperforate valve mounted to vibrate over said port and to cover the same and means to vibrate said valve in accordance with sound waves, the edges of said valve extending into the restricted space between said valve plate and the adjacent end of the sound box casing, whereby when a fluid is forced through said valve port all of the fluid will be reflected by the inner surface of the adjacent end of said casing within the trap thus formed to cushion said valve.

3. A sound box comprising a hollow casing having an inlet and a valve port, a valve arranged to coöperate with said port, means to vibrate said valve in accordance with sound waves, a member forming a chamber over the inlet side of said valve, said chamber having provisions for permitting air to enter said chamber, and a deflector arranged in said casing and provided with a marginal portion spaced from the interior walls of said casing and extending over and beyond the adjacent end of said member, whereby the air entering said inlet is first diverted outwardly toward the walls of the casing and then deflected in the reverse direction before entering said chamber.

4. A sound box comprising a hollow casing, a deflector located within said casing, and an annular support inclosed by said casing and secured to the edge of said deflector in spaced relation thereto to position said deflector in said casing.

5. A sound box comprising a hollow casing, a conical deflector located within said casing, and a cylindrical ring inclosed by said casing and secured to the edge of said deflector but spaced therefrom to position the same in said casing.

6. In a pneumatic sound box, the combination with a valve seat provided with a port, of a valve arranged to vibrate toward and away from said seat and having an imperforate major central portion extending over the entire area of said port and arranged upon the outlet side of said port, means arranged to vibrate said valve in accordance with sound waves, and means arranged to reflect all of the fluid current after it has passed through said port, to balance said valve, said valve being arranged between said last mentioned means and said seat.

7. In a pneumatic sound box the combination with a valve seat provided with a substantially circular port, of a valve arranged to vibrate toward and away from said seat and having an imperforate portion extending over the entire area of said port and arranged upon the outlet side of said port, means arranged to vibrate said valve in accordance with sound waves, and means arranged to reflect all of said fluid current after it has passed through said port, to balance said valve, said valve being arranged between said last mentioned means and said seat.

8. In a pneumatic sound box, the combination with a valve seat provided with a port, of a flexible valve arranged to oscillate toward and away from said seat and having an imperforate portion extending over the entire area of said port and arranged upon the outlet side of said port, means arranged to vibrate said valve in accordance with sound waves, and means arranged to reflect all of the fluid current after it has passed through said port, to balance said valve, said valve being arranged between said last mentioned means and said seat.

9. In a pneumatic sound box, the combination with a valve seat provided with a port, of a valve arranged to oscillate toward and away from said seat, said valve having an imperforate flexible portion extending over the entire area of said port, means arranged to vibrate said valve in accordance with sound waves, and means arranged to reflect all of the fluid current after it has passed through said port to balance said valve, said valve being arranged between said last mentioned means and said seat.

10. In a pneumatic sound box, the combination with a valve seat provided with a port arranged centrally with respect to said seat, a valve mounted to vibrate toward and away from said seat and having an imperforate portion extending over the entire

area of said port, means arranged to vibrate said valve in accordance with sound waves, and means arranged to reflect all of the fluid current after it has passed through said port to balance said valve, said valve being between said last mentioned means and said port.

11. In a sound box the combination with a casing having an inlet, of means coöperating with said casing for impressing sound waves upon a fluid current after it has passed through said inlet, and means arranged within said casing between said first mentioned means and said inlet for spreading said fluid current in said casing and comprising a deflector provided with a marginal edge spaced from the inner wall of said casing and means secured to and projecting from said edge for holding said deflector in position.

12. A sound box comprising a hollow casing having an inlet and a valved port, a valve arranged to coöperate with said port, means to vibrate said valve in accordance with sound waves, a member forming a chamber over the inlet side of said valve, said chamber being spaced apart from the inner walls of said casing and having provisions for permitting air to enter said chamber, and a deflector arranged in said casing and provided with a marginal flange projecting into the space between said member and the inner walls of said casing and covering the adjacent end of said member.

13. A sound box comprising a plate, provided with a port, a valve arranged upon one side of said plate to control said port, means to vibrate said valve in accordance with sound waves, and a cup arranged upon the other side of said plate forming an inclosure over said port, said cup comprising a substantially cylindrical wall surrounding said port and having one edge secured to said plate, and a substantially flat circular wall joined to the other edge of said cylindrical wall, and said cup being provided with a plurality of apertures extending therethrough in the circular region of connection between said cylindrical wall and said flat circular wall, the walls of said cup being otherwise imperforate.

In witness whereof, I have hereuuto set my hand this twenty-eight day of August, A. D. 1907.

WILBURN N. DENNISON.

Witnesses:
A. I. GARDNER,
ALEXANDER COOK.