

J. C. ENGLISH.
SOUND BOX FOR TALKING MACHINES.
APPLICATION FILED OCT. 31, 1910.

1,064,062.

Patented June 10, 1913.

Fig. 1.

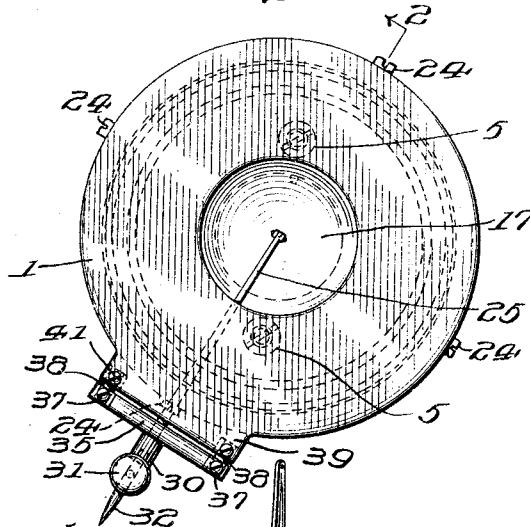


Fig. 2.

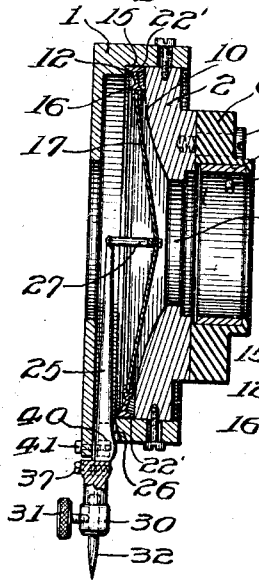


Fig. 4.

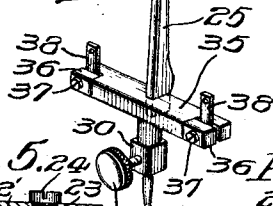


Fig. 5.

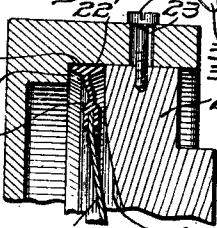


Fig. 6.

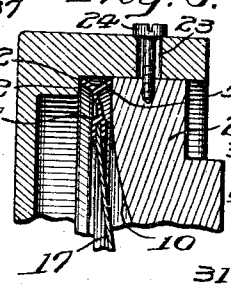


Fig. 3.

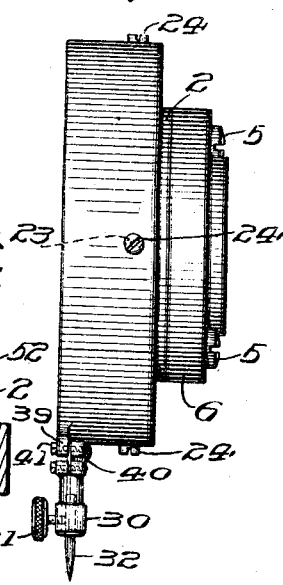


Fig. 7.

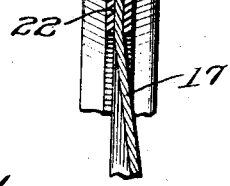
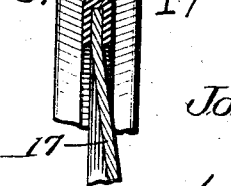


Fig. 8.



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SOUND-BOX FOR TALKING-MACHINES.

1,064,062.

Specification of Letters Patent.

Patented June 10, 1913.

Application filed October 31, 1910. Serial No. 569,845.

To all whom it may concern:

Be it known that I, JOHN C. ENGLISH, a citizen of the United States, and a resident of the city of Camden, county of Camden, and State of New Jersey, have invented certain new and useful Improvements in Sound-Boxes for Talking-Machines, of which the following is a full, clear, and exact disclosure.

The main objects of this invention are, to provide an improved sound box of simple, compact and durable construction that will record or reproduce sounds with great accuracy and efficiency; to provide in a sound box, an improved casing, an improved diaphragm, and an improved stylus bar and mounting therefor; and to provide other improvements as will appear hereinafter.

It has been contended that in sound boxes in which a thin flexible diaphragm is used and in which the sound vibrations are produced or recorded by flexing the diaphragm, the diaphragm acts like a reed and responds sympathetically to certain tones in a manner that produces undesirable results. It has also been contended that such a diaphragm is comparatively difficult to vibrate and does not act with sufficient sensitiveness to produce or to record delicate over-tones. In this invention these defects which it has been contended are incident to the recording or reproduction of sound by the flexing of a diaphragm, are obviated by utilizing, instead of a flexible diaphragm, a light substantially inflexible diaphragm and an improved mounting therefor whereby the diaphragm is permitted to vibrate as a whole without being flexed.

In the accompanying drawings, Figure 1 is a front elevation of a sound box constructed in accordance with this invention; Fig. 2 a transverse section on the line 2-2 of Fig. 1; Fig. 3 a side elevation of the same; Fig. 4 a perspective of a detail of the same; Fig. 5 a fragmentary enlargement of a portion of Fig. 2; Fig. 6 a view similar to Fig. 5 but showing a modified form of this invention; Fig. 7 an enlarged fragmentary diametrical section of the diaphragm and mounting or supporting ring shown in Figs. 1, 2 and 5 as they appear before being placed

in position in the sound box; and Fig. 8 is a view similar to Fig. 7, showing in a similar way the diaphragm and modified form of mounting therefor which are shown in operative position in Fig. 6.

Referring to the drawings, one embodiment of this invention comprises a cylindrical sound box casing or support composed of two main portions,—a cylindrical cup shaped front plate 1 and a back plate 2 telescoping into the front plate and provided with a circular central aperture 3 for the passage of sound waves.

Secured to the rear face of the back plate 2, coaxial therewith, by means of screw 5, is a yielding tubular extension 6 provided with a non-yielding lining 7 and an inwardly projecting stop 8, whereby the sound box may be telescoped over the usual tubular tone-arm or sound conveyer (not shown).

The inner surface 10 of the back plate 2 is preferably convexly curved flaring inwardly from the central aperture 3 to the outer periphery of the plate. The inner surface of the front plate 1 of the casing is preferably in the form of a stepped cylinder, providing an annular shoulder 12 facing rearwardly and spaced from the opposite inner surface of the back plate 2, forming therewith an annular recess 15 in which snugly fits a yielding gasket or mounting 16, in which is supported a diaphragm 17.

The gasket 16 is continuous or closed in structure, is preferably made of rubber or other suitable solid resilient or yielding material, and is preferably substantially T-shaped in cross section, comprising a base 18 substantially equal in width to the width of the recess 15, and having a cylindrical outer surface 19 slightly greater in diameter than the cylindrical inner surface of the recess 15. The inner surface of the base 18 is preferably convex in cross section and in the form of two oppositely disposed inwardly converging conical surfaces 20, which meet in a centrally arranged normally flat annular web 21 which forms a reduced intermediate portion of the gasket. This web 21 is integral with the base 18 and extremely thin and flexible. The inner portion of the web 21 terminates in an annular binder or holder

integral with and thicker than the web and is provided upon its inner edge with a centrally arranged annular cylindrical grooved recess 22, in which snugly fits the marginal portion of the diaphragm 17. The gasket may be held in position by means of wax 22' or other similar material applied between the base of the gasket and the inner cylindrical surface of the front plate 1.

The diaphragm 17 is preferably made of paper or any other light material, and when made of paper or other similar porous material may be impregnated with resin or any other substance or composition to make the diaphragm moisture-proof. The diaphragm is of substantially uniform thickness throughout its entire extent, and with the exception of its marginal portion, is preferably dished or conical in shape, converging rearwardly axially with the sound box casing. The marginal portion of the diaphragm is preferably in the form of a flat annulus, arranged in a plane perpendicular to the longitudinal axis of the sound box.

As the diameter of the gasket 16 is slightly larger than the internal diameter of the recess 15, in which it is held, the gasket will be held under a state of compression when the diaphragm and gasket are in operative position in the casing, and the thin portion of the web 21 will be slightly distorted laterally, as shown in Fig. 2 and enlarged in Fig. 5, from its normally flat condition. The diaphragm is thus held when in operative position under a slight tension or compression against the periphery 17' thereof by the gasket acting radially against the peripheral edge of the diaphragm and it may here be stated that so far as this application is concerned the expressions "periphery" or "peripheral portion" or "peripheral edge" refer to the outer edge of the diaphragm, that is to say, that portion of the diaphragm between the plane surfaces of the opposite sides of the marginal portion of the diaphragm.

To hold the back plate 2 in position and to permit of the adjustment of the back plate toward and away from the gasket 16, a series of oblong apertures 23 are provided through the cylindrical rim of the front plate, and a headed screw 24 extends loosely through each of these apertures and is threaded into the back plate. By this construction the pressing of the back upon the base of the gasket may be varied to increase or diminish the pressure of the gasket against the peripheral edge of the diaphragm.

For communicating vibrations corresponding to sound waves to or from the diaphragm, a stylus bar 25 is mounted to oscillate upon the front plate of the sound box casing, one end of the bar being within the

casing axially in front of the diaphragm, 65 and the bar extending radially outwardly through an aperture 26 provided therefor in the casing. The inner end of the stylus bar is pivotally connected to the outer end of a light but rigid connecting rod 27, the inner end of which is phonetically connected in any suitable manner to the central portion of the diaphragm, the outer end of the connecting rod being preferably bifurcated to receive the inner end of the stylus bar. The outer end of the stylus bar projects outwardly from the sound box casing and is provided with the usual stylus socket 30 and set screw 31 for holding a stylus 32 in place.

For supporting the stylus bar to oscillate upon a substantially fixed axis with respect to the sound box casing, the bar is provided outside of the casing with a cross-piece 35, rigid therewith, and projecting in opposite directions therefrom. Each end of this cross-piece 35 is recessed to receive a clamping plate 36, which is adjustably connected to the cross-piece by means of a headed screw 37, which extends loosely through the clamping plate and an aperture in one end of a flexible connector 38 and is threaded into the cross-piece 35.

Each of the two flexible connectors, or spaced yielding supports 38 is preferably made of thin tempered steel, but may be made of copper, fabric or other non-resilient material. Each connector 38 extends inwardly from the cross-piece 35, being clamped rigidly at its outer end between the cross-piece 35 and the clamping plates 36 by means of the screw 37. The inner end of each flexible connector 38 is similarly clamped against the rear surface of an extension 39, integral or rigid with the front portion of the sound box casing, by means of a clamping plate 40 and a screw 41. The flexible connectors 38 are thus arranged parallel to each other and in a plane substantially perpendicular to the longitudinal axis of the sound box casing.

The space between the extension 39 of the casing and the cross-piece 35 of the stylus bar is preferably only sufficient to permit of the necessary oscillation of the bar, and the bar is thus restrained to swing upon a substantially fixed axis, perpendicular to the bar and parallel to the plane of the marginal portion of the diaphragm.

In the modified form of this invention shown in Figs. 6 and 8, the sound box casing and the diaphragm 17 are constructed as hereinbefore described and the gasket 51 is substantially identical with the gasket 16, hereinbefore described except that the marginal portion or base of this gasket is bifurcated and in the form of two outwardly diverging portions 52. The outer diameter of the bifurcated base of this gasket is nor-

mally substantially the same as the inner diameter of the annular groove 15 in which it rests.

When the gasket 51 is in its operative position the free edges of the two portions 52 of the base of the gasket are clamped toward each other between the shoulder 12 of the front plate 1 and the inner surface of the back plate 2, so as to compress the gasket radially against the peripheral edge of the diaphragm 17. The thin web-like portion of the gasket is slightly distorted laterally from its normally flat plane by this compression.

The stylus bar and its mounting and other features of this modified construction may be the same as shown and hereinbefore described.

In the operation of this device, owing to the extreme thinness and flexible nature of the web forming the intermediate portion of the gasket, and to the extreme lightness and comparatively inflexible nature of the diaphragm, the diaphragm is extremely sensitive to respond to the vibration of the stylus bar in reproducing sound or to respond to the action of the sound waves in recording sound and in either case therefore the diaphragm vibrates as a whole without any appreciable flexing and there is very little, if any, appreciable loss of efficiency due to the diaphragm or its mounting.

It is evident that in applying this invention various changes might be made in the constructions without departing from the spirit of this invention or the scope of the appended claims.

Having thus described this invention, I claim and desire to protect by Letters Patent of the United States:

1. In a sound box, the combination with a substantially inflexible conical diaphragm, of a yielding gasket supporting said diaphragm, said gasket being held under an initial pressure forcing said gasket against the peripheral edge of said diaphragm.

2. In a sound box, the combination with a circular diaphragm, of a yielding gasket supporting the same, said gasket comprising an annular base portion greater in internal diameter than the diameter of said diaphragm and surrounding said diaphragm in the plane of the marginal edge thereof, and comprising a relatively thin annular portion between said base portion and said diaphragm.

3. A gasket for a sound box comprising an annular base portion, and a relatively thin normally flat annular portion carried by said base portion and projecting toward the center of said base portion from the internal surface of said base portion.

4. A yielding gasket for a sound box, comprising a base portion, a relatively thin

portion inclosed by and projecting inwardly from said base portion, and a holder extending inwardly from said relatively thin portion, and adapted to support the marginal portion of a diaphragm.

5. An annular yielding gasket for a sound box, comprising a base portion, a relatively thin portion projecting inwardly from said base portion, and a grooved holder extending inwardly from said relatively thin portion, and adapted to support the marginal portion of a diaphragm.

6. In a sound box, the combination with a diaphragm, of yielding means engaging the peripheral edge of said diaphragm, and adjustable means for compressing said yielding means to apply a yielding pressure upon said peripheral edge radially with respect to said diaphragm.

7. In a sound box, the combination with a yielding support, of a diaphragm having its marginal edge surrounded and engaged by said support, the diaphragm being of a size to place the yielding support under initial compression, and adjustable means acting on the yielding support to modify the state of compression of said support.

8. In a sound box, the combination with a diaphragm having a cupped central portion and a substantially flat rim, of a yielding gasket engaging said rim and held under an initial pressure, forcing said gasket radially against the peripheral edge of said rim.

9. In a sound box, the combination with a diaphragm, of a yielding gasket supporting said diaphragm, and bearing against the marginal edge thereof, said gasket comprising a yielding base portion having an internal diameter greater than the external diameter of said diaphragm and arranged in the plane of the marginal edge of said diaphragm, and comprising a relatively thin yielding portion between said base portion and said diaphragm.

10. An annular yielding gasket for a sound box, said gasket comprising a yielding annular base portion, and a yielding annular portion thinner than and inclosed by said base portion, integral therewith and projecting inwardly from the internal surface of said base portion.

11. An annular yielding gasket for a sound box, comprising a yielding annular base portion, a normally flat annular web thinner than said base portion and integral with and projecting inwardly therefrom, and an internally grooved holder projecting inwardly from said web and integral therewith.

12. In a sound box, the combination with a diaphragm of a gasket surrounding said diaphragm and supporting the same, said gasket comprising a holder embracing the

opposite sides of the margin of said diaphragm, having a relatively thin web-like yielding portion integral with said holder and surrounding the same.

- 5 13. In a sound box, the combination with a diaphragm of a gasket surrounding said diaphragm and supporting the same, said gasket comprising a holder embracing the opposite sides of the margin of said diaphragm, having a relatively thin web-like yielding portion integral with said holder and surrounding the same, said gasket being in contact with the marginal edge of said diaphragm.
- 10 14. In a sound box, the combination with a diaphragm vibratory as a whole, without flexing, and in a direction transverse to its own plane, of a yielding gasket surrounding and supporting said diaphragm, said gasket being free to flex, and being held under an initial state of compression by said diaphragm.
- 15 15. In a sound box, the combination with a diaphragm vibratory as a whole, without flexing, and in a direction transverse to its own plane, of a yielding gasket surrounding and supporting said diaphragm, said gasket being free to flex, and being held under an initial state of compression by said diaphragm, said gasket reacting to compress said diaphragm radially.
- 20 16. In a sound box, the combination with a dished diaphragm of substantially uniform thickness throughout its full extent, of a yielding gasket surrounding and supporting said diaphragm, said gasket being free to flex and being held in an initial state of compression by said diaphragm.
- 25 17. In a sound box, the combination with a diaphragm of a yielding gasket free to flex and supporting said diaphragm in an initial state of compression, said diaphragm reacting to hold said gasket under an initial state of compression.
- 30 18. In a sound box, the combination with a diaphragm vibratory as a whole without flexing, and in a direction transverse to its own plane, of a yielding gasket supporting said diaphragm and holding the same in an initial state of compression, said diaphragm reacting to hold said gasket in an initial state of compression.
- 35 19. In a sound box, the combination with a diaphragm vibratory as a whole without flexing and in a direction transverse to its own plane, of a yielding gasket entirely supporting said diaphragm and holding the same in an initial state of compression, said diaphragm reacting to hold said gasket in an initial state of compression.
- 40 20. In a sound box, the combination with a substantially inflexible diaphragm vibratory as a whole in a direction transverse to its own plane, of a yielding gasket inclosing

said diaphragm and contacting with the peripheral edge thereof and holding said diaphragm in an initial state of compression, said diaphragm reacting through its marginal edge to hold said gasket in an initial state of compression.

21. A gasket for a sound box, comprising a continuous base portion, and a relatively thin web portion carried and surrounded by said base portion.

22. A gasket for a sound box, comprising a continuous base portion and a relatively thin web portion carried by said base portion and projecting into the space inclosed by said base portion.

23. A gasket for a sound box, comprising a continuous yielding base portion, and a relatively thin yielding web portion surrounded and carried by said base portion.

24. A gasket for a sound box, comprising a continuous yielding base portion, and a relatively thin yielding web portion surrounded and carried by said base portion and wholly included in the space surrounded by said base portion.

25. In a sound box, the combination with a diaphragm, of yielding means engaging the peripheral edge of the diaphragm and confined peripherally, and adjustable means for compressing said yielding means laterally to apply yielding pressure on the diaphragm in the plane of said edge.

26. A gasket for a sound box comprising a base portion, and a relatively thin flat web portion carried by said base portion and projecting inwardly from the internal surface of said base portion.

27. In a sound box, the combination with a diaphragm, of a yielding support engaging the peripheral edge of the diaphragm, and adjustable means acting on said yielding support to cause the same to apply different yielding pressures on the peripheral edge of the diaphragm in a plane substantially normal to the axis of the diaphragm.

28. In a sound box, the combination with a diaphragm, of yielding means engaging the peripheral edge of the diaphragm, and adjustable means acting on said yielding means to produce varying pressures of said yielding means on the diaphragm, said yielding means exerting a pressure on the peripheral edge of said diaphragm independently of said adjustable means.

29. In a sound box, the combination of a substantially inflexible diaphragm, a flexible web member supporting said diaphragm by engagement with the peripheral portion thereof, and means for causing stress in said flexible member to act on the periphery of said diaphragm solely in a plane substantially normal to the axis of said diaphragm.

30. In a sound box, the combination of a substantially inflexible diaphragm, a yield-

ing member surrounding and supporting
said diaphragm, and means acting on said
yielding member to vary the stress of said
yielding member with respect to said dia-
5 phragm, said yielding member exerting a
pressure on the peripheral edge of said dia-
phragm independently of said adjustable
means.

In witness whereof, I have hereunto set
my hand this 27th day of October, A. D. 1910.

JOHN C. ENGLISH.

Witnesses:

CHARLES C. MORE,

FRANK B. MIDDLETON, Jr.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."