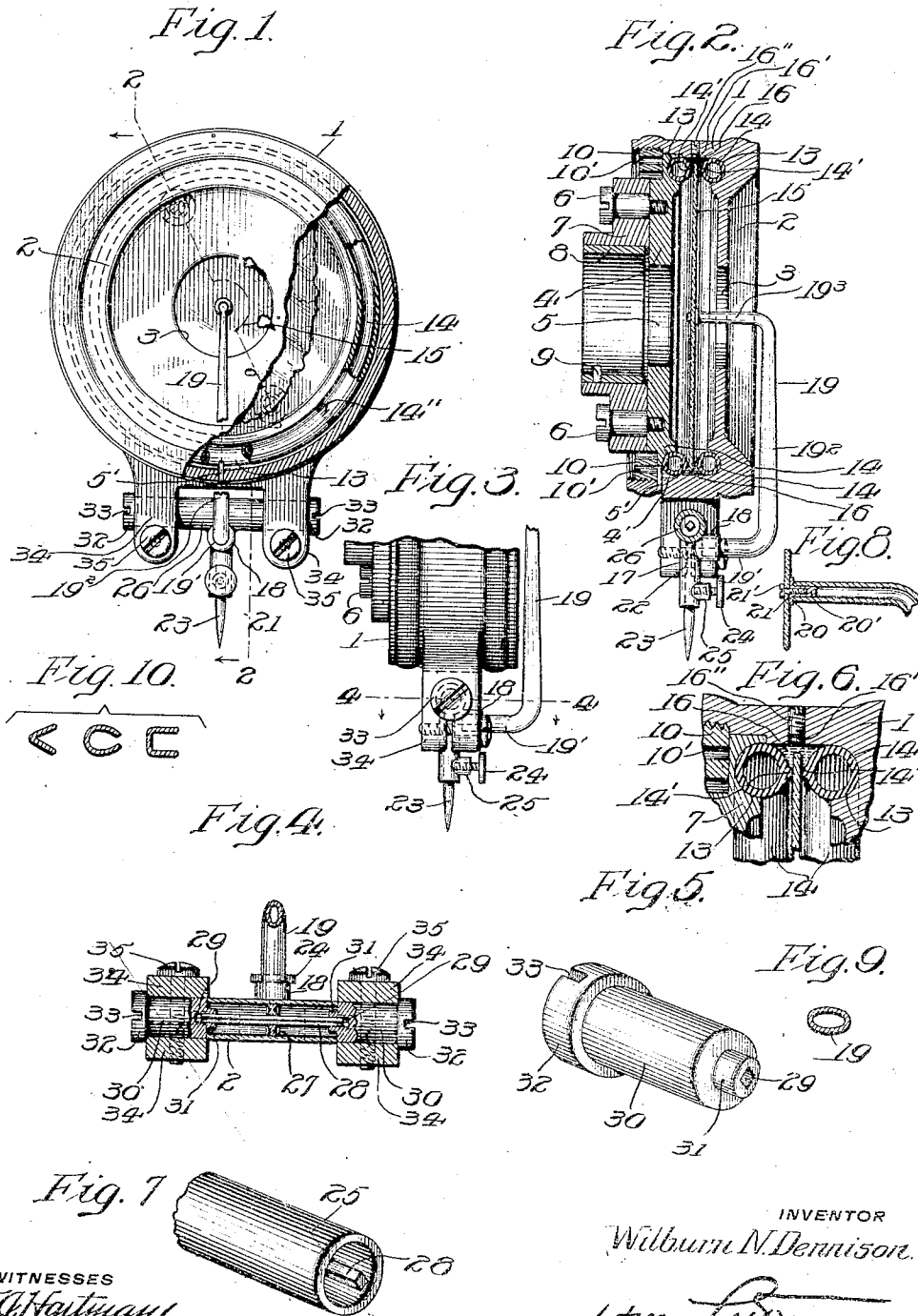


978,566.

Patented Dec. 13, 1910.



WITNESSES
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10me. 1910.
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UNITED STATES PATENT OFFICE.

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SOUND-BOX.

978,566.

Specification of Letters Patent. Patented Dec. 13, 1910.

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To all whom it may concern:

Be it known that I, WILBURN N. DENNISON, of the borough of Merchantville, county of Camden, and State of New Jersey, have invented certain new and useful Improvements in Sound-Boxes, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

The objects of my invention are to provide a sound box casing of durable form consisting of easily constructed parts, few in number, and which may be readily taken apart or assembled; to provide a light and rigid stylus bar; to provide a ring or gasket for the diaphragm which is symmetrical in construction and which is securely seated within the casing; to provide an improved form of pneumatic ring or gasket for the mounting of the diaphragm and to make provisions for inflating said gasket; to provide a torsional spring mounting for the stylus bar which restrains said bar to oscillate in a plane perpendicular to and upon an axis substantially in the plane of the diaphragm, and to provide means for the convenient and accurate adjustment of the tension upon said spring; to provide means for equalizing the cushioning effect of the atmosphere upon the opposite sides of the diaphragm and to prevent the loss of energy by the leaking of air past the diaphragm in order that the full effect of the action of the diaphragm upon the air may be delivered through the outlet of the sound box to the amplifying means; and to provide other improvements as will appear hereinafter.

In the drawings, Figure 1 is a front elevation partly in section of a sound box constructed in accordance with this invention; Fig. 2 a section on line 2—2 of Fig. 1; Fig. 3 a fragmentary side elevation of the sound box; Fig. 4 a section on line 4—4 of Fig. 3, looking in the direction of the arrows; Figs. 5, 6, 7 and 8 are enlarged perspective views of details of construction, and Fig. 9 is a sectional view on the line 9—9 of Fig. 2 and Fig. 10 shows modified forms of hollow stylus bars.

Referring to the drawings, one embodiment of this invention comprises a sound box casing having a substantially cylindrical outer shell 1, provided with an inwardly extending annular flange integral therewith

upon one end forming the front end 2 of the casing, and provided with an axially circular opening 3 for the admission of the inner end of a stylus bar. The shell 1 has a cylindrical bore opening rearwardly, and having a rearwardly opening annular internal recess forming an annular internal shoulder with the front portion of the bore and with this recess snugly fits a removable back plate 4 forming the rear end of the casing. This back plate 4 has an axial circular opening 5, of a diameter equal to the diameter of the opening 3 in the front end of the casing, and is provided in its edge with a longitudinal key-way 4' adapted to be engaged by a key 5' rigid with the casing to prevent the plate from turning.

For attaching the sound box to the usual tubular sound box arm or support, the rear face of the end plate 4 of the sound box casing has secured coaxially thereto, by means of screws 6, the usual tubular rubber extension 7 provided with a metallic lining 8 and a key 9. The end plate 4 is held in position in the outer shell of the casing by means of a ring 10 having external threads which engage internal threads provided therefor upon the rear end of the interior of the outer shell of the casing, the ring being provided with spanner holes 10' whereby it may be adjusted. The back plate is normally held by the ring 10 so that the inner surface of the plate adjacent its periphery rests against the rearwardly facing internal annular shoulder of the casing.

Oppositely disposed annular grooves 13, are provided upon the inner side of the front end of the casing and upon the inner side of the rear end of the casing, and are arranged coaxially with the casing to receive tubular rubber rings or gaskets 14, respectively, between which is supported a diaphragm 15, the periphery of the diaphragm being preferably spaced from the inner surfaces of the casing.

The gaskets are substantially circular in cross section, and are each provided with an annular projecting rib 14' on the side of the gasket contacting with the diaphragm so that the vibrations of the diaphragm will not be affected by a varying surface contact with the gasket. The walls of the grooves 13 containing the gaskets are substantially semicircular in cross section and are adapted to fit closely around the sides of the gaskets.

to force the gaskets to deliver their full efficiencies.

The gaskets 14 are preferably each constructed from a single piece of tubing, the ends of which may be brought together and joined by a raw rubber or rubber cement, or a continuous rubber tube may be provided with a raw rubber portion as indicated at 14'' and a pneumatic pump, similar to a hypodermic syringe is then inserted through the joint or portion 14'' and the air is forced into the tube to expand it and to give it the desired resiliency, after which the pump is withdrawn from the tube, and the puncture is closed by the self-healing action of raw rubber or similar material, thus retaining the pressure in the tube. This construction provides a gasket which is absolutely symmetrical with respect to the axis passing through the center of the ring, normal to the plane thereof and which will respond uniformly to the vibrations of the diaphragm.

The whole mounting or support for the diaphragm which, in the form illustrated in the drawings comprises the casing and the rings or gaskets 14, forms, with the diaphragm 15 an annular space 16 which incloses the periphery of the diaphragm. This annular space is preferably filled with a liquid, such as water, glycerin or diluted glycerin or other suitable liquid which may be injected between the diaphragm and one of its gaskets, or through the casing after the sound box has been assembled, as through a suitable opening 16' in the casing, which may be afterward closed in any suitable manner as by a screw 16''. This construction prevents losses of energy by the escape of air from the chamber on one side of the diaphragm to that on the other side thereof, and insures the delivery of the full effect of the action of the diaphragm upon the air back of the same, to the amplifier.

The diaphragm is located substantially midway between the opposite inner surfaces of the ends of the casing, dividing the interior of the casing into two chambers, of substantially equal capacity upon opposite sides respectively of the diaphragm which have, as heretofore pointed out axial openings or outlets of substantially equal area. By this means the cushioning effect of the air upon the opposite sides of the diaphragm is substantially equalized.

The stylus bar comprises a light forging 17, forming the lower or outer portion of the bar. This forging is provided adjacent its inner end, with a forwardly extending tubular lug 18 into which is forced or rigidly secured a tubular portion 19 extending substantially the entire distance between the axis of oscillation of the stylus bar and the diaphragm. The tubular portion 19 is preferably bent in any suitable manner, for in-

stance, to form parts 19', 19² and 19³ to clear the sound box casing and to enter the opening 3 in the front of the casing. Within the tubular upper end 19³ of the tubular portion of the bar, may be forced a cylindrical lug 20' projecting from an enlarged portion 20 forming the head of the bar. The head 20 of the bar engages against the outer surface of the diaphragm and is clamped thereto by a screw 21 which passes through the diaphragm, and is threaded axially into the head of the bar, the head 21 of the screw engaging the diaphragm upon its side opposite to the head of the bar, to clamp the diaphragm to the bar.

To increase the rigidity of the stylus bar, the major part of the upper or inner portion 19 of the bar is preferably made substantially oval or elliptical in cross-section, its longer diameter of the cross-section being substantially in the plane of oscillation of the bar, as shown in Fig. 4; but the extreme upper end 19³ and the extreme lower end 19² on the upper portion 19 of the bar are preferably made cylindrical in cross section to facilitate the attachment of the same to the head 20 and the forging 17 respectively. The lower end of the stylus bar is provided with a longitudinal socket 22 substantially in alinement with the plane of the diaphragm and with the axis of oscillation of the stylus bar, to receive the usual stylus needle 23 which may be held in place by a set screw 24 threaded through the lug 25 of the forging 17.

For mounting the stylus bar, the upper end of the forging is preferably formed as a substantially cylindrical sleeve or tubular portion 26 having its longitudinal axis substantially coincident with the axis of oscillation of the stylus bar and substantially parallel to the plane of the diaphragm, the tubular portion projecting in opposite directions from the stylus bar. Centrally within the said tubular portion 26 and substantially in alinement with the stylus socket 22 is a bushing or washer 27 which forms a rigid support for the torsional spring 28 extending therethrough and in opposite directions therefrom forming oppositely extending spring arms spaced from the inner surface of said tubular portion.

The bushing or washer 27 supporting the torsional spring 28 is preferably made of soft steel or brass, and after being positioned in the said tubular portion 26, is preferably compressed by oppositely disposed punches to upset the edges thereof to bring the periphery of the washer in very tight and rigid engagement with the inner surface of the tubular portion 26 and the surface of the spring.

The spring 28 is preferably square, polygonal, irregular, or of any other form than round in cross section to prevent the spring

from turning in the bushing 27 and also so that the ends of the spring may be of suitable shape to fit into the sockets 29 of the keys 30, by which the spring is adjusted and supported, and by which the desired tension is applied to said spring.

The keys 30 are cylindrical in shape and have reduced inner ends 31 containing the sockets 29 and enlarged outer ends forming heads 32 which are slotted as at 33 to receive a screw driver for rotating the keys to adjust the stylus bar and bring torsional stress to bear upon the arms of the spring 28. The keys 30 are rotatably adjustable in the spaced split arms 34 which are rigid with the sound box casing, and the keys are held in any desired fixed positions in the arms by means of the clamping screws 35 which extend through the split portions of the arms. The inner surfaces of the heads bear against the outer surfaces of the spaced arms and the inner ends of the keys bear lightly against the outer ends of the transverse tubular portion of the stylus bar there- by constraining the bar to oscillate on an axis parallel to the diaphragm.

In adjusting the stylus bar mounting the ends of the spring 28 are rotated in opposite directions from their normal positions, by means of a screw driver acting upon the keys as heretofore stated, and the keys are then clamped into position by means of the clamping screws 35, so that the stylus bar is supported in its normal position, the spring being held subject to a balanced initial torsional tension due to the positions of the keys, thus holding the ends of the spring securely in the keys, but leaving the spring free to respond to the slightest vibration of the stylus bar in a plane perpendicular to the diaphragm.

By making the pivotal portion 17 of the stylus bar of a light forging, the walls of the sleeve 26 and of the lug and of the stylus socket may be made very thin so that the whole stylus bar mounting, including the upper portion 19, is substantially a hollow shell, very strong, but exceedingly light.

Although I have described a construction in which the upper part 19 of the stylus is made hollow, I do not wish to be construed as limited to a strictly tubular form, or flattened tubular form for that part of the stylus bar extending between the point of oscillation of the stylus bar and the diaphragm, inasmuch as a stylus bar, made hollow in any suitable manner, is fully within the aim and scope of my invention. Thus, I may make the upper part of the stylus bar hollow in a number of ways, as by making the same of pressed metal, or any other suitable material, stiffened by webs, as shown in Fig. 10, and when I employ the word "hollow" in the appended claims, I intend it to apply to all the forms like or

similar to those illustrated in the drawings, whether the section be of an open or closed form.

Although I have illustrated the various details of construction whereby all the objects above enumerated may be embodied in one sound box, it is obvious that many of the details may be separately applied to various kinds of sound boxes to great advantage. It is further obvious that my invention is capable of embodiment in many forms, without departing from the spirit of this 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. The combination with a diaphragm, of a pair of concentric yielding rings of substantially circular cross section having oppositely disposed circular ribs projecting therefrom engaging against the opposite sides of the diaphragm respectively.
2. A mounting for a diaphragm, comprising a yielding member having a body portion and a projection extending outwardly from said body portion and carried thereby to engage the diaphragm.
3. A mounting for a diaphragm, comprising a yielding member having a body portion, and an annular rib projecting outwardly from said body portion to engage the diaphragm.
4. A gasket for a sound box, comprising a yielding tubular member having a rib projecting therefrom.
5. A gasket for a sound box comprising a yielding tubular member having a self healing portion through which the gasket may be inflated.
6. A gasket for a sound box, comprising a yielding tubular member having a portion composed of raw rubber.
7. A gasket for a sound box, comprising a pneumatic member having a rib projecting therefrom.
8. In a sound box, the combination with a diaphragm, of a pneumatic gasket having a rib thereon in contact with the diaphragm.
9. The combination with a diaphragm, of an inflated gasket contacting therewith for supporting the same, and having an imperforate tubular main or body portion.
10. In a sound box the combination with a diaphragm, of a mounting therefor forming with said diaphragm an inclosed space around the periphery of the diaphragm and means within said space to prevent the passage of air therethrough.
11. In a sound box the combination with a casing, of a diaphragm, means to support said diaphragm in said casing, said means forming with said diaphragm and said casing an annular space inclosing the periphery of the diaphragm and a liquid within said

space to prevent the passage of air there-through.

12. In a sound box the combination with a diaphragm, of a mounting therefor forming with the diaphragm a space inclosing the periphery of said diaphragm and a glycerin seal in said space.

13. In a sound box, the combination with a diaphragm, of a mounting therefor, forming an inclosed space, and a liquid seal in said space.

14. The combination with a stylus bar, of a mounting therefor comprising a torsional spring secured to said bar, a key to turn said spring, said key having one end provided with a socket to receive the end of said spring and its opposite end enlarged to form a head, and means engaging said key and bearing against said head to hold said key in a fixed position.

15. A stylus bar provided with a tubular portion extending axially thereof, a torsional spring fixed in said tubular portion extending longitudinally and spaced from the inner surface thereof, and means to hold the outer end of said spring in a fixed position.

16. The combination with a stylus bar, of a mounting therefor comprising oppositely extending torsional spring arms, keys adjustably secured to the ends of said arms and means to hold said keys in fixed positions.

17. A stylus bar provided with a tubular portion, oppositely extending torsional spring arms secured within said portion and spaced from the inner surface thereof, keys secured to said arms and engaging against said bar, and means to hold said keys in fixed positions.

18. The combination with a stylus bar, of a mounting therefor comprising a torsional spring secured to the bar and having a portion otherwise than round in cross section and a rotatably adjustable key engaging said angular portion to hold the spring in position.

19. The combination with a stylus bar, of a support therefor comprising a yielding member and a bushing surrounding said member and engaging an internal seat provided therefor in said bar, said bushing being compressed into rigid engagement with said member and said seat.

20. The combination with a stylus bar, of a mounting therefor comprising a torsional spring secured to said bar, and rotatably adjustable means supporting said spring and for applying a torsional stress to said spring.

21. The combination with a stylus bar, of a mounting therefor comprising a torsional spring having a portion of square cross section secured to said bar, and a rotatably adjustable key for engaging said portion.

22. The combination with a stylus bar, of a mounting therefor comprising a torsional

spring secured thereto, and rotatably adjustable means held against movement in one direction longitudinally of its axis while being rotated for holding said spring.

23. In a sound box, a stylus bar having a tubular portion, a spring support within said tubular portion and a spring passing therethrough, said parts being rigidly held together by the frictional contact between the same.

24. In a sound box, the combination with a stylus bar, of a spring square in cross section upon which said stylus bar is mounted to oscillate, an adjustable key engaging an end of said spring, and means for holding said key in a fixed position.

25. The combination with a stylus bar, of a torsional spring upon which said stylus bar is mounted, the ends of said spring being of a shape other than round, and means provided with sockets within which the ends of said bar are fitted for applying a torsional stress to said spring.

26. In a sound box the combination with a diaphragm, of a casing surrounding said diaphragm, said casing being provided with openings of substantially equal area upon opposite sides of the diaphragm respectively, a mounting for said diaphragm forming with said diaphragm an annular chamber, inclosing the periphery of said diaphragm, and means in said chamber to prevent the air from passing therethrough.

27. In a sound box the combination with a casing, of a diaphragm mounted therein, forming two chambers of substantially equal capacity upon opposite sides respectively of the diaphragm, said casing having openings of substantially equal area into each of said chambers respectively, and a liquid seal to prevent the passage of air around said diaphragm from one of said chambers to the other.

28. In a sound box, a stylus bar mounted to oscillate in a fixed plane, said bar having a hollow portion oblong in transverse section and with its longer transverse diameter extending in the plane of oscillation of said bar.

29. In a sound box, a stylus bar having a hollow tapering upper portion oblong in transverse section, extending substantially from the axis of oscillation of said stylus bar, to the upper end thereof.

30. In a sound box, a stylus bar having a transversely oblong tubular portion.

31. In a sound box, a stylus bar having a tubular inner end and an engaging member forced into said tubular end.

32. A sound box casing comprising a hollow shell having an internal rearwardly facing annular shoulder, a removable back plate resting in said shell against said shoulder, and a ring in said shell in the rear of said plate, for holding said plate in position.

33. A sound box casing comprising a hollow shell having an internal rearwardly facing annular shoulder, a removable back plate resting in said shell against said shoulder, a ring in said shell in the rear of said plate, for holding said plate in position, and a diaphragm in said casing in front of said back plate, and a yielding gasket between said diaphragm and said back plate, and in contact with said back plate.

34. A sound box casing comprising a hollow shell having an internal rearwardly facing shoulder, a removable back plate fitting in said shell in the rear of said shoulder, and a ring in said shell in the rear of said back plate, for holding said plate in position.

35. A sound box casing comprising a hollow shell provided with an open end, a plate fitting in said open end, a diaphragm in said casing inside of said plate, means rigid with said casing for limiting the movement

of said plate toward said diaphragm, yielding means between said diaphragm and said plate and held in position by said plate, and means for holding said plate against outward movement with respect to said casing.

36. A sound box casing comprising a hollow shell provided with an open end, a plate forming a closure for said open end, a diaphragm in said casing inside of said plate, means for limiting the movement of said plate toward said diaphragm, a yielding gasket between said diaphragm and said plate and held in position by said plate, and means for clamping said plate against said gasket.

In witness whereof I have hereunto set my hand this eleventh day of July, 1908.

WILBURN N. DENNISON.

Witnesses:

DEAN S. RENWICK,
ROBERT H. CRAWFORD.