No. 675,331. Patented May 28, 1901.

E. R. JOHNSON.

SOUND RECORDING AND REPRODUCING DEVICE.

(Application filed Jan. 20, 1900.)

(No Model.)

Fig. 1.

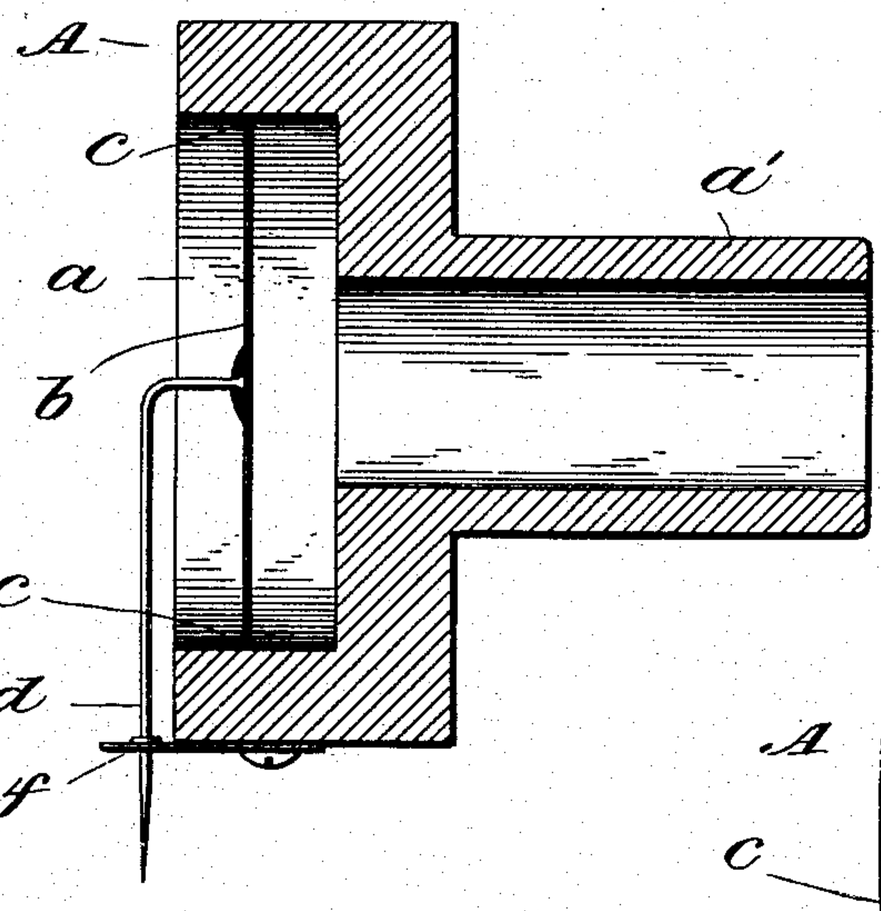


Fig. 3.

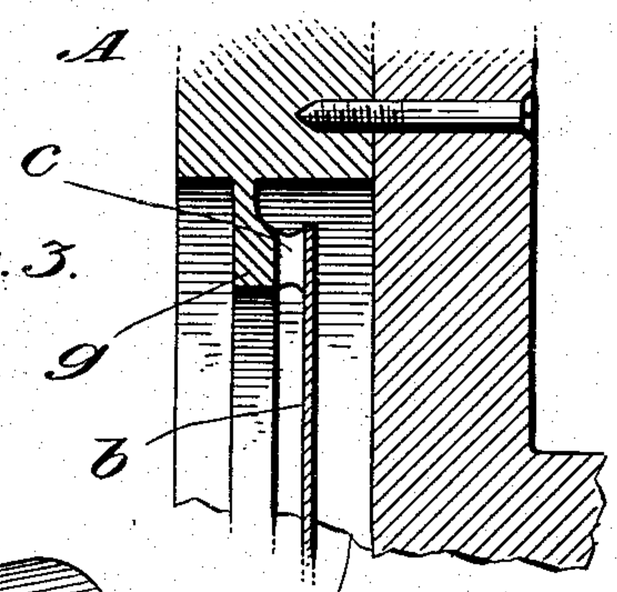


Fig. 2.

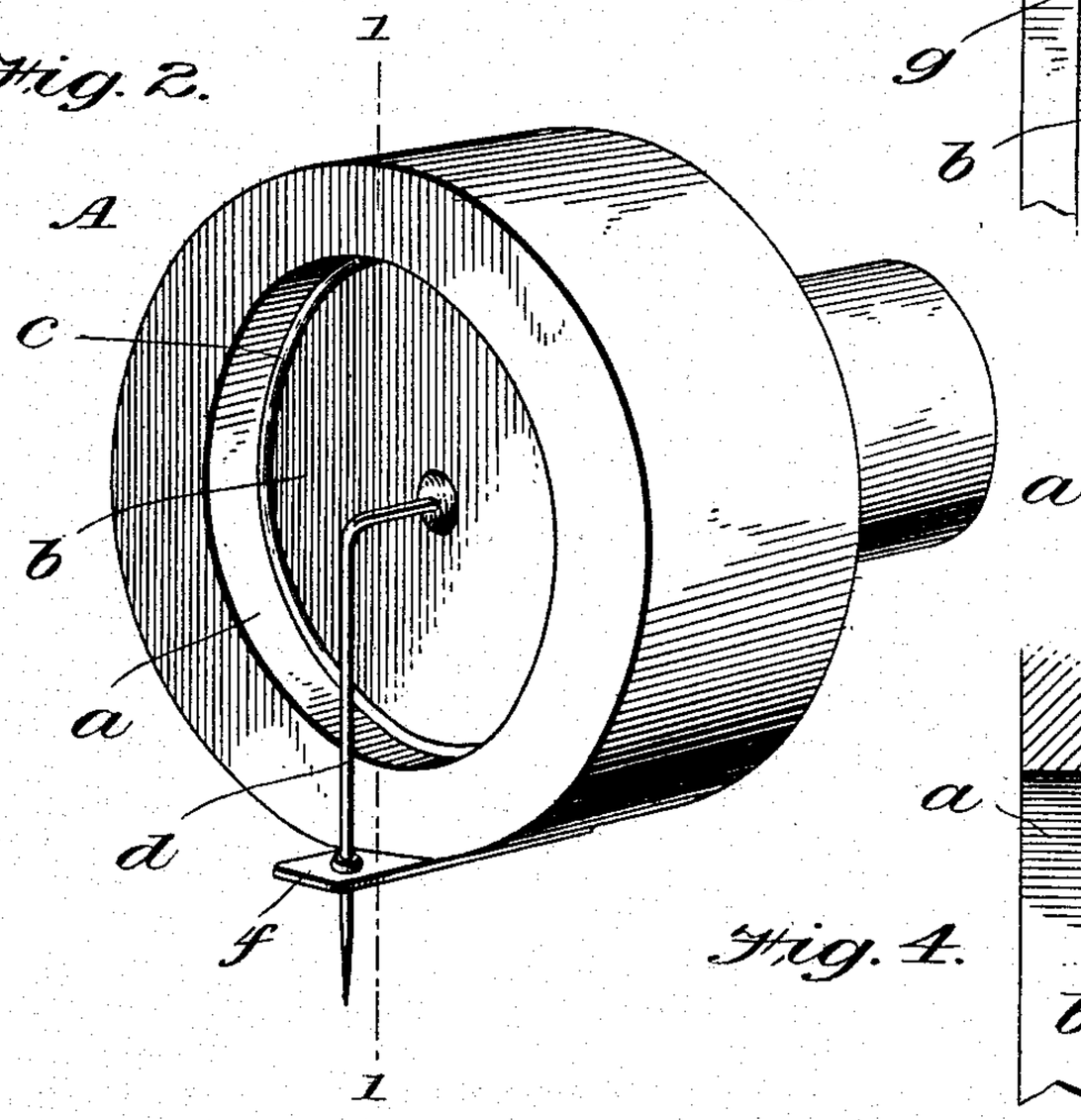
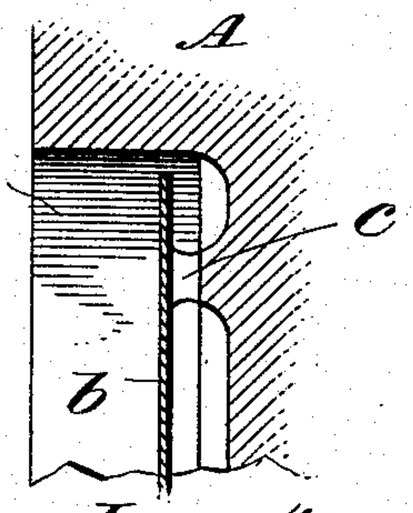


Fig. 4.



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UNITED STATES PATENT OFFICE.

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SOUND RECORDING AND REPRODUCING DEVICE.

SPECIFICATION forming part of Letters Patent No. 675,331, dated May 28, 1901.

Application filed January 20, 1900. Serial No. 2,177. (No model.)

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have invented a certain new and useful Improvement in Sound Recording and Reproducing Devices, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention has relation to sound recording and reproducing machines; and it consists in the improvements hereinafter particularly described and claimed.

The object of my present invention is to improve the construction and arrangement of sound-boxes for recording and reproducing purposes. It has especial relation to the means for damping the diaphragm in the sound-box, and consists, essentially, in a liquid damper or film provided in contact with the diaphragm and with the adjacent walls of the sound-box casing.

As is well known, in order to produce efficient results dampers have been and are considered quite essential at or about the periphery of the diaphragm in sound recording and reproducing machines and are generally employed in the practical machines now in use and usually in the form of solid gaskets of rubber or other compressible material provided on one or both sides of the diaphragm. In my endeavors to improve the construction of the sound-box so as in the first place to produce upon the recording-tablet as nearly as possible a true record of the sound-waves such as impressed upon the diaphragm and to subsequently reproduce in clear audible tones the recorded sounds from the record I have discovered that a film of liquid provided about the periphery of the diaphragm may be employed with most successful results as a damping medium, the liquid forming what may be termed a "liquid" gasket, being held, preferably, about the peripheral portions of the diaphragm and to the adjacent walls of the sound-box casing in a thin body or film by capillary attraction or adhesion. In employing a liquid damper such friction as exists between the diaphragm and a compressible damper of solid material is reduced to a minimum and the elasticity of the liquid, when properly applied, allows of the vibration of the diaphragm to any desirable practical extent without breaking the seal or film of the liquid.

The accompanying drawings illustrate sound-boxes embodying my present invention.

Figure 1 is a sectional view through the center of the sound-box on the lines 1 1 of Fig. 2. Fig. 2 is a front perspective view of the same. Fig. 3 illustrates another form of my invention. Fig. 4 illustrates still another form.

A represents the sound-box casing, having the usual recess portion *a*, which is connected with the sound receiving or transmitting tubular portion *a'*. The diaphragm *b* is located, as illustrated, in the recessed portion *a* and is of a diameter about equal to or slightly less than the diameter of the said recess. A body or film *c* of any suitable liquid is applied at or about the peripheral portion of the diaphragm *b* and is held by capillary attraction or adhesion thereto and to the immediately adjacent portion of the walls of the recess *a*, forming a thin film or body of liquid between such portion of the diaphragm and the adjacent portions of the walls of the recess in the nature of a liquid gasket. As illustrated in Fig. 1, the liquid is preferably applied to both faces of the diaphragm about the peripheral portion, also extending in a thin film between the peripheral edge of the diaphragm and the adjacent portions of the walls of the recess, thus connecting the main portions of the liquid film on each side of the diaphragm, though it is clear that the liquid damper may be, if desired, on one side only—as, for instance, in cases where the diaphragm fits very snugly at its periphery against the walls of the recess and in the arrangements shown in Figs. 3 and 4, though even in the case of the tight-fitting diaphragm the liquid film may be applied, if desired, to both sides of the diaphragm about its peripheral portions.

The damper need only be a very thin film of liquid, and no more liquid should be applied than may be readily held by capillary attraction or by adhesion. It may be applied by holding the sound-box, when the diaphragm

is in position, at a suitable angle and then introducing the liquid from an oiler or other convenient device around the edges of the diaphragm in a manner so that the liquid will at once be properly distributed and adhere to the peripheral portions of the diaphragm and to the adjacent portions of the walls of the recess, or it may be applied at one point when the sound-box is held at a desirable angle, and the diaphragm, if slightly loose, is then turned around in the casing, carrying the liquid with it about its peripheral portions, and by this means the liquid will be evenly distributed and applied and form the desirable film on both sides of the diaphragm. It is clear that the tendency of the liquid in being thus applied will be to intrude between the peripheral edges and the adjacent walls of the sound-box casing when the diaphragm is not a tight fit, and will thus form also the film on the inner face of the diaphragm and the walls of the casing adjacent to the peripheral portions.

It is apparent that the liquid film may be applied to the diaphragm at other portions than its periphery and may be connected with the interior wall of the casing indirectly instead of directly, and produce efficient results—as, for instance, through the medium of a ring or portion, such as *g* in Fig. 3, projecting from the walls of the casing and arranged adjacent to one or both of the faces of the diaphragm. In such case the liquid may be applied to the surface of the diaphragm and the film formed between it and the adjacent face of the ring depending portion *g*, as illustrated in Fig. 3. In such construction the liquid may be applied to the face of the diaphragm some distance from the periphery, as illustrated. Again, the liquid may be applied to the rear face of the diaphragm and attached to the inner rear wall of the recess—as, for instance, in the manner illustrated in Fig. 4. It is also clear that other forms of construction may be employed in carrying out my invention.

Different kinds of liquids may be employed, such as water and various kinds of oils, oil being preferable. Evaporation is, of course, constantly occurring, and therefore liquids which evaporate slowly are to be preferred. The liquid must be replenished from time to time as evaporation occurs.

The gasket or film of liquid applied in the manner herein described admits the diaphragm to vibrate freely throughout its entire area on account of the elasticity of the said liquid, while at the same time this liquid gasket, which is viscous to a certain extent, clings or adheres to the diaphragm and to the roof of the sound-box casing and acts as a damper to prevent the diaphragm from vibrating too freely, the capillary attraction or adhesive qualities of the liquid being sufficient to prevent the diaphragm from breaking away from the liquid film.

A stylus-bar of any desired construction—such, for instance, as the stylus-bar *d* illustrated in the drawings—is connected with the diaphragm *b* and is supported in any desirable manner—as, for instance, by the support *f*, as illustrated in the drawings—the construction of the stylus and manner of support and connection being immaterial.

My invention herein described is adapted for both recording and reproducing purposes, though particularly important for recording purposes to produce primarily upon the recording tablet or material a record as nearly true as possible.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a sound recording and reproducing device, a vibrating diaphragm, and a liquid gasket for damping the vibrations of said diaphragm.

2. In a sound recording and reproducing machine, a sound-box casing, a diaphragm therein, and a liquid damper applied to the diaphragm adhering thereto and to a wall in the casing.

3. In a sound-box, a diaphragm therein, and a thin elastic liquid film, or gasket, adhering to said diaphragm and to the portion of the casing adjacent thereto by capillary attraction, substantially as described.

4. In a sound-box for sound recording and reproducing machines, a diaphragm mounted in said sound-box and a film of liquid provided about the peripheral portions of the diaphragm, said film adhering thereto and to the adjacent portions of the inner walls of the sound-box, substantially as described.

5. In a sound recorder or reproducer, a casing, a diaphragm therein and a liquid damper provided around the peripheral portion of the diaphragm adhering thereto and to the adjacent portions of the inner wall of the casing by capillary attraction, substantially as described.

6. In a sound-box, a casing, a diaphragm mounted therein of a diameter slightly less than the diameter of the recess in which it is mounted and a film of liquid damping material applied to the peripheral edge and to the opposite faces of the diaphragm about the periphery, said film being attached to the inner walls of the casing adjacent to the peripheral edges of the diaphragm, substantially as described.

In witness whereof I have hereunto set my hand this 6th day of January, A. D. 1900.

ELDRIDGE R. JOHNSON.

Witnesses:
JNO. T. CROSS,
FRANK D. GRAHAM.