W. J. TANNER.

SOUND BOX.

APPLICATION FILED SEPT. 18, 1905.

908,625. Patented Jan. 5, 1909.

3 SHEETS—SHEET 1.

Fig. 1.

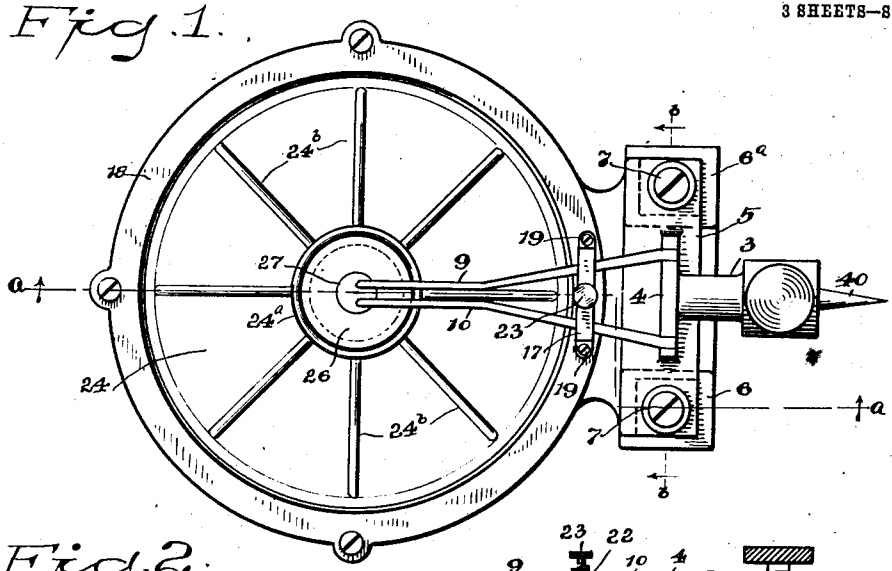


Fig. 2.

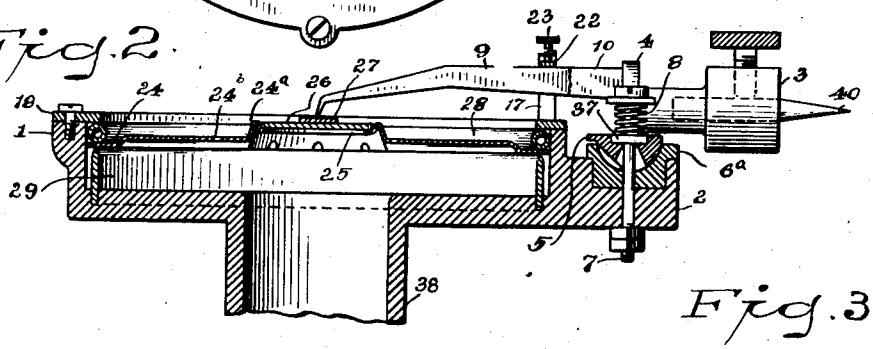


Fig. 3.

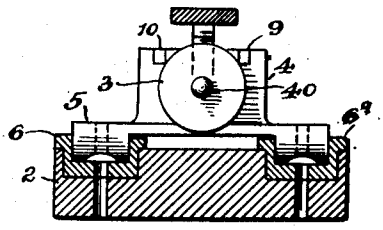


Fig. 4.

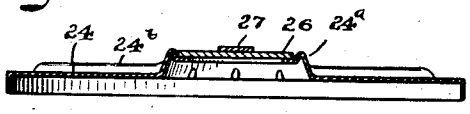


Fig. 5.

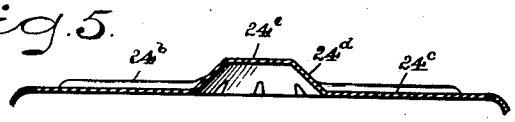
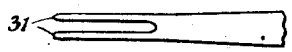


Fig. 6.



WITNESSES

H. A. Lamb.

S. J. Chaffee.

INVENTOR

William J. Tanner.

BY Geo. O. Phillips

his ATTORNEY

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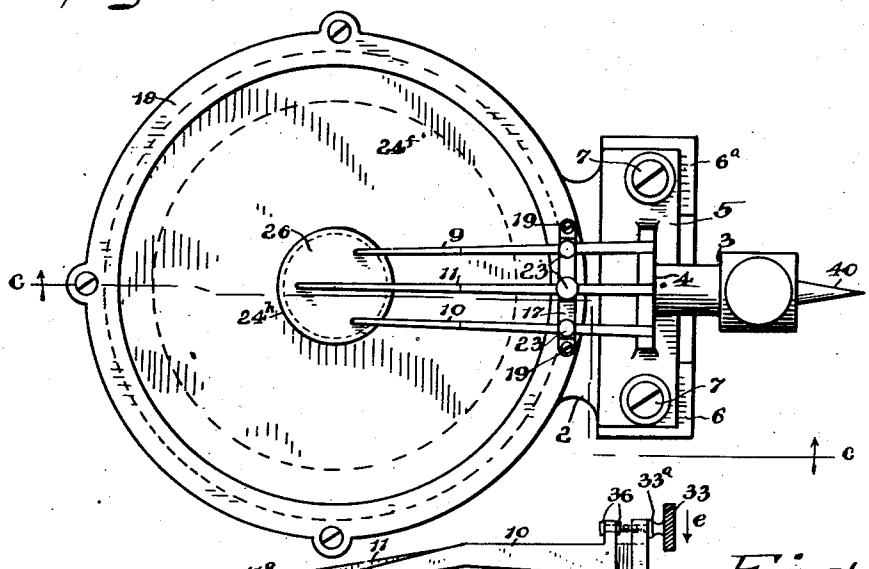
3 SHEETS—SHEET 2.

Fig. 7.



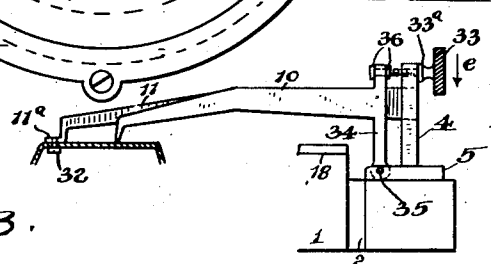


Fig. 12.

Fig. 8.

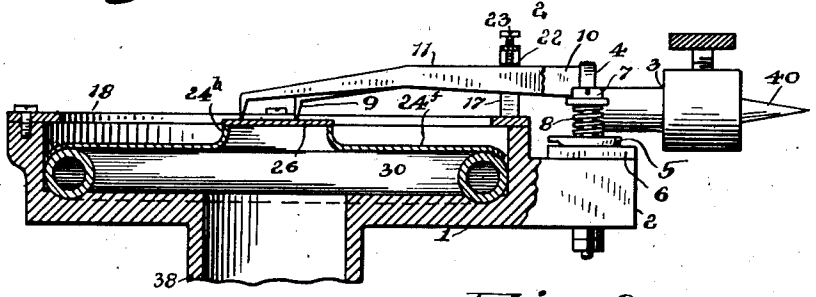
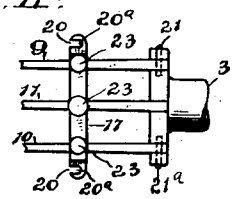
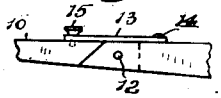


Fig. 9.

Fig. 11.





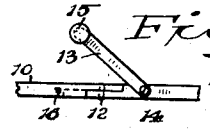


Fig. 10.

WITNESSES

H. C. A. Lamb.

B. J. Chaffee.

INVENTOR

William J. Tanner.

BY Geo. O. Phillips.

his ATTORNEY

W. J. TANNER.

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3 SHEETS—SHEET 3.

Fig. 14.

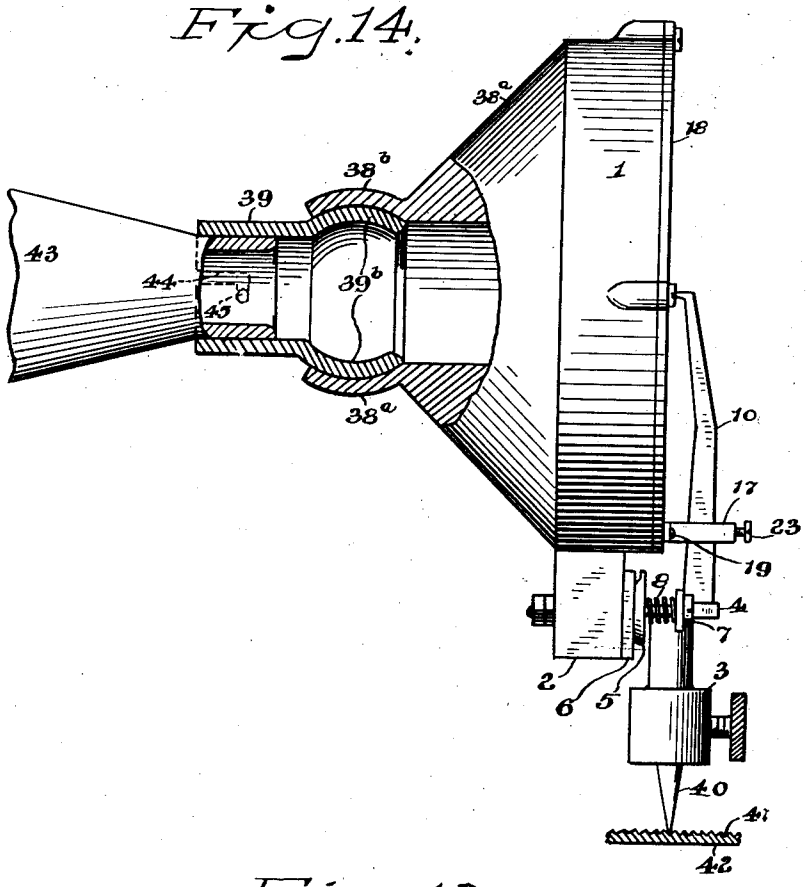
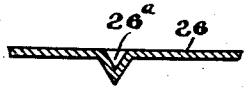


Fig. 13.



WITNESSES

H. A. Lamb.
E. J. Chaffee

INVENTOR

William J. Tanner.

BY Geo. D. Phillips

his ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM J. TANNER, OF BRIDGEPORT, CONNECTICUT.

SOUND-BOX.

No. 908,625. Specification of Letters Patent. Patented Jan. 5, 1909.

Application filed September 18, 1905. Serial No. 278,861.

To all whom it may concern:

Be it known that I, WILLIAM J. TANNER, a citizen of the United States, and a resident of Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Sound-Boxes, of which the following is a specification.

My invention relates to improvements in recording and reproducing sound for sound-boxes for talking machines, and it consists in certain details of construction to be more fully set forth in the following specification.

To enable others to understand my invention reference is had to the accompanying drawings in which:

Figure 1— is an upper plan view of a sound-box embodying my improvements, among which, may be mentioned, the double needle-arm: Fig. 2— is a broken sectional view on line *a a* of Fig. 1: Fig. 3— is a sectional view through the case bracket and soft metal seats of the needle arm support on line *b b* of Fig. 1: Fig. 4— is a central sectional detail view of a diaphragm similar to the one shown at Fig. 2 except that the edges are flanged: Fig. 5— is a detail central sectional view of a diaphragm having a raised solid center: Fig. 6— is a broken detail modification of the needle-arm: Fig. 7— is an upper plan view of the sound-box showing a plurality of needle-arms: Fig. 8— is a broken vertical sectional view on line *c c* of Fig. 7: Fig. 9— is a broken detail side elevation of one of the needle-arms jointed in the body portion: Fig. 10— is a broken plan view of Fig. 9: Fig. 11—is a broken upper plan view of the needle-arm support and broken view of three needle-arms mounted therein, two of which are pivotally supported, showing also a modified construction of the muffler standard. Fig. 12— is another view showing an arrangement for moving the whole needle-arm: Fig. 13— is a detail broken sectional view of a diaphragm with a depression in the surface to receive the sharp pointed end of the needle-arm: Fig. 14— is a side elevation of a sound-box, broken sectional view of its socket, sectional view of the sleeve with a ball and socket connection between the sleeve and socket, and broken view of a sound-box supporting arm, and also a broken sectional view of a record disk.

Its construction and operation are as follows:

1 represents the case usually employed in instruments of this character.

2 is a bracket projecting from the case and integral therewith. 3 the needle holder. The needle-arm support 4, and the semi-circular base 5 are, preferably, made of one piece. This base is adapted to rest in semi-circular non sound conducting seats 6 and 6^a, and it is frictionally secured thereto by the slot headed bolts 7.

8 are springs, one only being shown at Figs. 2 and 8. These are interposed between the heads of the bolts 7 and the base 5.

One feature of my several improvements consists in employing a plurality of needle-arms from two to any number that may be found most desirable to effect the best results. Increasing the number of arms improves the tone; making it more mellow and rounded.

In Figs. 1, 2 and 3, two arms, 9 and 10, are employed with their rear ends anchored in the upright or support 4. In Figs. 7 and 8 another and central arm 11 is employed. All but one of these arms can be arranged to be swung out of contact with the diaphragm and thereby regulate the tone in accordance with the record desired to be played. This can be done in various ways, among which I show, Figs. 10 and 11, the arm 10 jointed so that the forward end of the arm is adapted to be turned upward by swinging on the pin 12.

13 is a horizontally swinging plate pivotally supported on the screw 14 of one of the arm sections, while 15 is an attaching screw adapted to engage with the threaded hole 16 in the other arm section when desired to clamp the two sections together.

In Figs. 1, 2, 7 and 8, the muffler standard 17 is secured to the case ring 18 by means of the screws 19. In Fig. 12 is shown a modification of this standard in which the slots 20 open into the screw holes 20^a so that, this standard can readily be removed whenever it is desirable to temporarily elevate one of the needle-arms, which movable arms, in this construction, are pivotally supported on the pins 21 and 21^a located in the needle-arm support 4. The muffler 22 is raised and lowered, Figs. 2 and 8, by means of the screws 23.

Mica is the principal material now used for diaphragms. I have, however, found that celluloid alone or combined with mica, or like material gives much better results. For band records, where it is necessary to bring out all of the instruments, I have found that a diaphragm made entirely of celluloid gives the best results. In vocal records, where it is necessary to sharpen the tone, a combination of two different materials, like, for instance, celluloid and mica, give better results than where the diaphragm is all made of one material. Good results are also obtained by diaphragms made of vegetable matter like, for instance, wood, and particularly the inner surface of the bark of trees.

In Figs. 1, 2 and 4, the large or outer diaphragm 24 is provided with the raised central portion or curb 24^a having the central hole or opening 25. 26 is a small mica diaphragm overlying this opening and it is secured in position by cement or any other suitable means. 27 is a small circular disk of any suitable material interposed between the small mica diaphragm and the needle-arm points. This disk will serve to prevent the sharp point of the needle-arm scratching or marring the diaphragm. It can also be used as means to unite the points of the plural arms into, virtually, one contact point. If desired, the slight depression 26^a, Fig. 13, could be formed in the upper surface of the diaphragm to receive the sharp point of the needle-arm. This will keep the point of the arm in one unchangeable position. The large diaphragm 24 is stiffened by means of the radial ribs 24^b. In Fig. 5 is shown the diaphragm 24^c and the raised central portion 24^d together with the upper needle-arm contact surface 24^e as being all of one piece and that, preferably of celluloid. In Figs. 7 and 8 the larger or outer diaphragm 24^f is devoid of ribs and the small central diaphragm 26 rests on top of the curb 24^h instead of being seated in a depression formed on the curb 24^a shown at Figs. 1, 2 and 4.

In Fig. 2 is shown the flexible tube 28 and the case-ring 18, which, in connection with the ring 29, made of bamboo, rubber, or other like substance, assist very materially in lengthening the vibratory sound waves. In Fig. 8 the large flexible tube or gasket 30 supports the diaphragm 24^f whose outer curved edge 24^g partially embraces said gasket. This feature of curving the edge of the diaphragm, see also Fig. 5, downwards, will cause it to lie snugly on the gasket, and thus obviate the necessity of placing a second gasket above the diaphragm. The pressure of the needle-arm will depress the diaphragm in its central portion, and, when the diaphragm is straight, will cause its outer edge to curl or turn upward and produce a false sound or "blast." This is entirely overcome by curving the edge of the diaphragm downward.

If desired, the main body portion of the needle-arm may be made of a single piece while the contact ends 31 may be formed, "comb" like," as shown at Fig. 6.

If desired, the arm or arms adapted to be continually held in contact with the diaphragm, can be secured in any desirable manner.

In Fig. 12 the arm 11 is provided with the foot 11^a and the binding screw 32.

The means for elevating the side movable needle-arms, whether single or double, shown at Fig. 12, is by the screw 33 passing through a threaded hole in the support 4, with its free end revolubly mounted in the rocker arm 34, which arm is pivotally supported on the pin 35 of the base 5. 36 are collars on each side of the upper end of this rocker arm to prevent end play in the elevating screw 33. Turning this screw in the direction of arrow *e* will withdraw the shoulder 33^a from contact with the vertical face of the support 4 a distance sufficient to elevate the diaphragm contact point of the needle-arm 10 so as to carry it out of engagement with the diaphragm. To reëngage the movable needle-arm with the diaphragm, turn the screw 33 in the opposite direction until the shoulder 33^a rests against the support 4, which shoulder will act as a stop to limit the pressure of the needle-arm against the diaphragm. The advantage of being able to raise one or more of the arms out of contact with the diaphragm enables the volume and tone to be readily and quickly changed to suit the character of the record.

37, Fig. 2, is a piece of rubber or other non metallic substance interposed between the springs 8 and the base 5 to serve as insulators to counteract or soften the metallic vibrations.

It will be understood that, in all of the constructions shown, whether the points of the needle-arms are free or secured to the diaphragm, it is important that the contact of the needle-arm with the diaphragm be such as to insure that both the diaphragm and needle-arm vibrate in perfect unison.

A large per cent. of the unharmonious sound emanating from a talking machine is due to the bad tracking of the needle. In other words, the spiral groove in the upper surface of a disk-record, in which the needle travels, is very apt to be more or less irregular as to its spiral formation so that, the needle, instead of keeping where it should, viz: at the bottom of this groove, is forced, at times, hard against the sides. This irregular tracking produces a disagreeable rasping sound and very unpleasant to the listener. Another disadvantage of irregular tracking is that the wearing qualities of the

needle are very much shortened so that, the needle is thrown away after it has traveled over a record but once, besides, the record itself is also damaged to a more or less extent.

I have completely overcome the objectionable features above set forth by the construction shown at Fig. 14, wherein a ball and socket connection, presently to be described, is formed between the sound-box and the sound-box supporting arm. 38[a] is a socket integral with the sound-box case 1, which socket, in this construction, is made heavier than the usual sockets, 38, Figs. 2 and 8, for the purpose presently to be described. 39 is a sleeve having the ball shape formation 39[a], which, together with the shell or ball shape formation 38[b], on the outer end of the socket 38[a], forms a ball and socket joint which allows a free movement to the sound-box in any direction. This enables the extreme point of the needle 40 to maintain its correct position at the bottom of the groove 41 of the record disk. For it will readily be seen that, if the sound-box can be allowed to follow the irregularities of the spiral groove, the needle will naturally gravitate to the bottom of the groove, and, always working in the bottom of the groove, and out of contact with the sides thereof, the needle, will not only stand up to its work much longer, but the objectionable features, above noted, will also be eradicated. As the ball and socket connection makes the position of the sound-box, balanced on the fine needle point, very sensitive, and liable thereby to jump out, I find it necessary to add sufficient weight to counteract this tendency. This I have shown by increasing the base of the size of the socket 38[a], close to the sound-box. This weight, however, can be otherwise applied, either by increasing the weight of the socket, or the case of the sound-box, or in any other desirable manner found most convenient to effect a good working balance of the box on the needle point. This weight should, however, be placed, as near as convenient, directly over the needle so as to obtain all of the advantages necessary to produce the best results, and thus relieve the needle of any tendency to drag a load which would cause it to deviate from the bottom portion of the spiral groove: Therefore, it will be observed that, the greatest amount of metal in the socket 38[a] is close to the sound-box. While a ball and socket connection could be placed at some point in the supporting arm 43, the result would not be the same as I now obtain, for the reason that, the farther this connection is removed from the sound-box, the more the box will be thrown out of balance, and, consequently, the greater will be the amount of metal to be carried by the box, and the greater will be the drag on the needle.

The outer end of the sleeve 39 and the supporting arm 43 are removably connected together by means of the angular slot 44 and pin 45.

While I use the term "ball and socket joint" to express the means whereby the sound-box is permitted to move in any direction, I desire it to be understood that this term covers a swivel joint, or universal joint or any well known means adapted to give like results.

While I show the points of the needle arms adapted to be secured to the plate 27 so that said arms will be tied or united at the said points, I hold myself at liberty to tie said arms together at any other point in their length that will be found most convenient.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a sound-box, the combination with the case 1 having the bracket 2, of the semi-circular concave seats 6 and 6[a] located in said bracket, needle-arm support 4 provided with the semi-circular base 5 adapted to oscillate in said seats, bolts 7 adapted to operatively secure contact between said base and seats, springs on said bolts and above said base to maintain working contact between said base and seats, for the purpose set forth.

2. In a sound-box, the combination with the case and diaphragm, of a plurality of needle arms united into, practically, a single structure, and means common to the arms for operatively connecting the same to the diaphragm, for the purpose set forth.

3. In a sound-box, the combination with the case and a diaphragm, of a plurality of needle arms united at some point in their length and out of contact with each other except at the point of union, and means common to said arms for operatively connecting the same to the diaphragm, for the purpose set forth.

4. In a sound box, the combination with the case, and a diaphragm, of a plurality of arms associated with said diaphragm for transmitting the vibrations, means common to said arms for operatively connecting the same to the diaphragm, and means for adjusting said arms in relation to the diaphragm for regulating the volume of sound.

5. In a sound box, the combination with the case, and a diaphragm, of a plurality of arms associated with said diaphragm for transmitting the vibrations, and means interposed between the ends of said arms and the diaphragm and constituting a common means for operatively connecting the arms to the diaphragm.

6. In a sound box, the combination with the case, and a diaphragm, of a plurality of arms associated with said diaphragm for transmitting the vibrations, said arms extending in substantial parallelism with each other, and means connecting the ends of said arms and the diaphragm and constituting a common connection for the arms with the diaphragm, whereby the vibrations are caused to be transmitted in a uniform volume.

Signed at Bridgeport in the county of Fairfield and State of Connecticut this 11th day of Sept. A. D. 1905.

WILLIAM J. TANNER.

Witnesses:
HENRY A. HOUSE,
FRANK B. FELTON.