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L. F. DOUGLASS
SOUND REPRODUCING MACHINE

Filed July 15, 1919

Fig. 2.

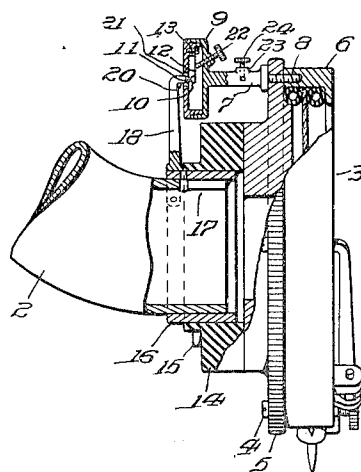


Fig. 1.

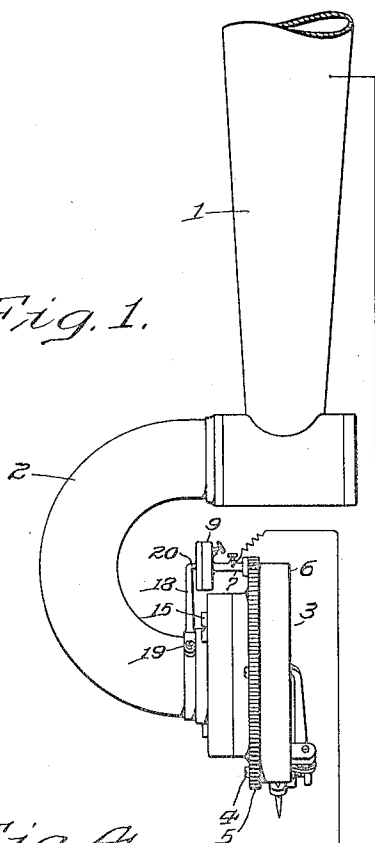


Fig. 3.

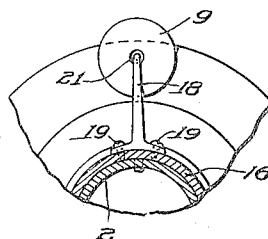
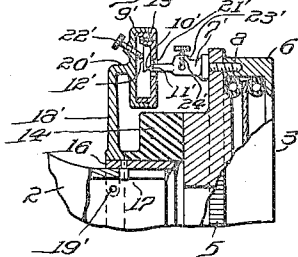
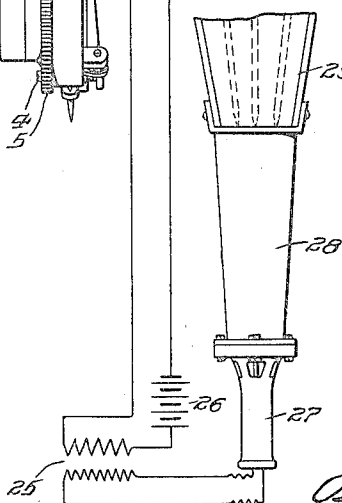


Fig. 4.



WITNESS

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UNITED STATES PATENT OFFICE.

LEON F. DOUGLASS, OF SAN RAFAEL, CALIFORNIA, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SOUND-REPRODUCING MACHINE.

Application filed July 15, 1919. Serial No. 311,031.

To all whom it may concern:

Be it known that I, LEON F. DOUGLASS, a citizen of the United States, residing at San Rafael, county of Marin, and State of California, have invented certain new and useful Improvements in Sound-Reproducing Machines, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to sound reproducing machines comprising a reproducer including a vibratile diaphragm and stylus with means to receive and amplify the sound waves created thereby, and to discharge them to the atmosphere, and pertains more particularly to combining therewith means adapted to transform, during the reproduction of sound from a record the bodily and mechanical vibrations of the sound box into electrical undulations, to transmit these undulations over an electrical circuit to a suitable telephone receiver, and to then convert the same into audible sound which may be discharged through an amplifying means, located in any desired position.

One of the objects of my invention, is to produce, in addition to the usual sound reproduction a secondary reproduction of sound by the use of a telephonic circuit and also to convey the primary and secondary reproductions to a point where the secondary vibrations enhance and commingle with the primary vibrations with the combined resultant effect of producing a more perfect reproduction in louder tones and with improved qualities.

In my copending application, Serial No. 93,275 filed April 24, 1916 is disclosed a mechanism wherein sound emitted from the sound box of a sound reproducing machine is converted into electrical undulations and finally into audible sound vibrations. A microphone, in that case, is primarily operated by the vibrations or impulses of the air in the conveyor passage leading from the sound box diaphragm through the goose neck to the microphone which is mounted upon the goose neck extension.

My present invention differs from the device of my copending application in that instead of making use of pneumatic pulsations from the sound box diaphragm to actuate a microphone I utilize the relative mechanical vibrations of the sound box casing and sound

conveying tube, to actuate a microphone mechanism.

A further object of my invention is to add to the usual reproduction of sound a quality or characteristic which may be described as "body" or "fullness" as distinguished from the quality of "thinness" as applied to sound or tones.

Another object is to so arrange or construct the improvement or attachment that it may be adapted to present day machines without substantially changing the construction thereof nor varying the operation except in the manner intended and herein disclosed.

Such other objects and advantages that flow from my improvement will more fully appear in the following specification. In the drawings, in which I have shown a preferred embodiment of my invention,

Fig. 1 is a plan view of a portion of a sound reproducing machine containing my improvement.

Fig. 2 is a fragmentary sectional view of the sound box with a microphone casing attached thereto and showing one manner of operating the microphone by the relative vibrating motion between the sound box and the goose neck forming a part of the sound conveyor.

Fig. 3 is a view, partly in elevation and partly in section showing how the microphone may be attached to the sound box and to the sound conveying tube, and,

Fig. 4 is a fragmentary sectional view of a modified form of my invention.

Referring now more particularly to the drawings I have shown thereon a sound reproducing means comprising a tone arm 1, a goose neck 2 and a sound box 3 suitably connected to the end of the goose neck. The usual form of sound box is generally provided with a plurality of screws 4 for the purpose of securing the back plate 5 of the sound box to the casing 6. In carrying out my invention a microphone is connected to any part of a sound box casing and in the preferred form illustrated I make such connection by removing one of the screws 4 and inserting in its place a post 7 which is suitably threaded at one end to fit within the screw socket 8 of the screw that has been removed, and which is formed on the other end with a microphone transmitter including the casing 9.

The microphone casing 9 houses a pair of carbon buttons 10 and 11 the former of which is mounted upon a spring 12 suitably secured to the casing 9 by a screw 13 or the like.

The sound box 3 is provided with a yielding rubber cushion 14 secured to the sound box back-plate 5 by means of screws 15 and also has coaxially secured therein a metal sleeve or sound box casing support 16 which is adapted to be secured by the usual bayonet joint 17 to the goose neck 2. This sleeve 16 preferably projects a little beyond the rubber backing or cushion 14 in order that a post 18 may be rigidly secured thereto by means of screws 19 or the like. This post carries at its upper end an integral lateral extension 20 which projects through an aperture 21 provided in the side of the casing 9 to the interior thereof and has fixed upon the end of this projection the carbon button 11 which is adapted to contact with and press against the carbon button 10 mounted on the spring 12. The rubber cushion 14 is interposed between the sound box and the goose neck 2 whereby any of the mechanical vibrations imparted to the metal parts of the sound box will not be communicated to the goose neck but will be insulated therefrom by said rubber cushion. By mounting a microphone rigidly upon the sound box casing and contacting a carbon button carried thereby with another carbon button mounted upon the post 18 rigidly secured to the sleeve or sound box casing support 16 relative motion will occur between the microphone casing which carries the button 10 and the post 18 which carries the button 11, such movement being produced by the mechanical vibration of the sound box and the coordinate vibration of the microphone casing relative to the sleeve 16 and post 18. Since the buttons are constantly in contact the pressure therebetween will be varied in proportion to and in correspondence with the vibrations imposed upon the sound box casing during the reproduction of sound from a record.

In accordance with the well known operation of a microphone the varying pressure produced between the carbon buttons will, when connected in an electrical circuit, vary the electrical conductivity therein in conformity with the vibrations affecting the pressure of the buttons of the microphone.

For the purpose of regulating and applying the desired pressure between the buttons the microphone transmitter may be provided with an adjusting screw 22 the end of which contact with and presses against the spring 12, as shown in Figure 2. The post 7 may also be provided with a circuit-wire binding-post portion 23 and a binding-screw 24. The electrical circuit referred to above leads from this post 23 to the primary

of a suitable transformer or induction coil 25, thence to battery 26 and then connects to any suitable portion of the metal sound conveyor, such as the tone arm 1. The circuit is then completed through the tone arm 1, the goose neck 2, the sleeve 16, the post 18, the lateral extension 20, the carbon buttons 11 and 10, the spring 12, microphone casing 9 and back to the binding post 23. The secondary circuit of the coil 25 leads to a telephonic receiver 27 of the same type disclosed in my copending application hereinbefore referred to. Sound is thus reproduced telephonically at the receiver 27 into audible vibrations which are pneumatically conveyed through the member 28, and discharged through the amplifying horn 29.

Inasmuch as the operation of the microphone arises from the relative movements of the sound box and sound conveying tube, the position of the microphone may be reversed from that shown in Figures 1, 2 and 3 to that shown in Figure 4, in which case the post 7' suitably secured in the screw socket 8, merely carries at its end a carbon button 11' and the post 18' secured to the sleeve 16 by means of the screws 19' is provided at its upper end with an integral lateral extension 20' the end of which is formed into a microphone casing 9'. This microphone also houses a pair of carbon buttons 10' and 11', the former of which is mounted upon a spring 12' suitably secured to the casing 9' by a screw 13' or the like and the latter of which is secured to the end of the post 7' which extends into the casing 9' through the aperture 21' formed in the side thereof and into contact with the former. The post 7' may be provided with the binding post 23' and binding screw 24', as in the form shown in Figures 1, 2 and 3. The electrical circuit also may be the same or similar to that shown in Figures 1, 2 and 3. By mounting the microphone rigidly upon the sleeve 16 and contacting a carbon button 10' carried thereby with the carbon button 11' mounted upon the post 7' rigidly secured to the sound box casing relative motion will occur between the post 7' which carries the button 10', such movement being produced by the mechanical vibration of the sound box and the co-ordinate vibration of the post 7' relative to the sleeve 16, post 18' and the microphone casing 9'. Since the buttons are constantly in contact the pressure therebetween will be varied in proportion to and in correspondence with the vibrations imposed upon the sound box casing during the reproduction of sound from a record.

For the purpose of regulating and applying the desired pressure between the buttons the microphone may be provided with an adjusting screw 22' the end of which contacts with and presses against the spring 12'.

In operation the sound box is caused to operate over a record in the usual manner and sound is reproduced by the sound box diaphragm and conveyed through the sound conveying passage in the goose neck 2 and tone arm 1 as in the usual conventional form of talking machines.

The vibrations, however, which are set up in the metal parts of the sound box and are not communicated to the goose neck by reason of the interposed rubber cushion 14, are, in the embodiment shown in Figures 1, 2 and 3, directly imparted to the microphone casing 9, and spring 12 resulting in a movement of the same relative to carbon button 11, post 18 and sleeve 16, and in a variation of the contact pressure between the carbon buttons 10 and 11; and in the modification shown in Figure 4, are directly imparted to the post 7' and carbon button 11' resulting in a movement of the same relative to the spring 12', casing 9', post 18' and sleeve 16 and in a variation of the contact pressure between the carbon buttons 10' and 11'. The contact pressure between the carbon buttons, being thus varied in accordance with such vibrations, correspondingly varies the electrical current in the circuit of said buttons and the transformer 25. The latter induces similar but intensified undulations in the circuit leading to the telephone receiver 27 where the undulations are converted into audible air vibrations in the supplementary tone arm 28 and amplified in the horn 29.

While I have shown a preferred and a modified form of device illustrating my invention I do not, however, consider my invention limited to the particular details described and shown, but that my invention comprehends all equivalent structures which do not depart from the spirit of my invention as herein disclosed nor from the scope of the appended claims.

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

1. In a sound reproducing machine comprising a record supporting and rotating means, a sound box, and a sound conveying tube, the combination of a telephonic circuit including a microphone connected between the casing of the said sound box and the sound conveying tube and adapted to convert the relative vibrations therebetween into electrical undulations in said circuit, a receiver operated by said circuit and adapted to convert said undulations into audible vibrations and amplifying means communicating with said receiver.

2. In a sound reproducing machine, the combination with a talking machine having a rigid sound conveying conduit and a sound box mounted on said conduit, said sound box comprising a casing, a diaphragm

mounted therein, a stylus for vibrating said diaphragm, and a yielding connection between said sound box casing and said conduit, of a microphone comprising two elements movable with respect to each other to vary an electric current therethrough, said elements being respectively connected to said rigid conduit and to said casing whereby the slight vibration of said casing with respect to said conduit produced by the vibration of said diaphragm and stylus, actuates said microphone.

3. In a talking machine, the combination of a rigid sound conveyer, a sound box mounted on said conveyer and having a casing, a diaphragm, a stylus bar adapted to be vibrated by and in accordance with sound undulations in a sound record groove and yielding means between said casing and said conveyer, of a microphone, the current varying elements of which are respectively connected to said casing and to said rigid conveyer whereby the vibrations of said casing, with respect to said conveyer, induced by the action of said stylus on said diaphragm, operate to correspondingly vary an electric current in and through said microphone.

4. In a sound reproducing machine, the combination with a reproducer adapted to produce primary sound vibrations from a record tablet and including a sound box casing, a swinging tubular arm carrying said reproducer and operating as a direct conduit therefrom for said vibrations, and yielding means between said sound box casing and said arm of means connected to said sound box casing to produce therefrom tonal vibrations secondary in character, said means including a microphone actuated by the vibrations of said casing, with respect to said tubular arm, a telephone receiver, an electrical circuit, including said microphone and operating said telephonic receiver, and an amplifying chamber into which said receiver discharges.

5. In a sound reproducing machine, the combination with reproducing means including a sound box casing and a diaphragm therein adapted to produce primary vibrations from a record tablet and a conduit for conveying such vibrations, of a telephonic circuit including a microphone having a part rigidly mounted upon said sound box casing and another part rigidly mounted with respect to said conduit, whereby said parts are relatively and operatively actuated by the vibrations of said sound box casing with respect to said conduit and a receiver for receiving impulses from said microphone and converting them into audible sounds and amplifying means for amplifying said audible sounds.

6. In a sound reproducing apparatus, having means to reproduce sound vibrations from a rotatable tablet, said means

comprising a sound box casing, a stylus and a conduit for said sound vibrations, the combination of an electrical circuit, a microphone included in said circuit and mounted
 5 between said sound box casing and said conduit to receive mechanical vibrations of said sound box casing as a whole relative to said conduit and to convert said vibrations into electrical undulations in said circuit, a
 10 receiver actuated by said circuit for converting said undulations into audible sound vibrations and an amplifying means for amplifying said audible sound vibrations.

7. In a sound reproducing machine comprising a sound box having a casing, a sound conveying tube and resilient sound insulating means connecting said casing to said tube whereby said casing is adapted to vibrate relative to said tube, the combination
 20 of a telephonic circuit including a microphone having an element rigidly secured to said casing and another element rigidly connected to said tube whereby the mechanical vibration of said casing as a whole relative
 25 to said tube vibrates said first element relative to said second element and correspondingly varies the current in said telephonic circuit, a telephonic receiver actuated by said circuit and a horn connected to said
 30 receiver for amplifying the audible sound vibrations produced by said receiver.

8. The combination with a talking machine, comprising a sound box casing, a diaphragm and a stylus bar, and rigid means
 35 on which said sound box casing is yieldingly mounted, of a microphone having two current varying elements, one of which is rigidly attached to said sound box casing and the other of which is stationarily mounted
 40 with respect to said rigid means, whereby the vibrations of said casing, with respect

to said rigid means, produced by the vibrations of said stylus bar and diaphragm, are operative to correspondingly vary the electric current of said microphone.

9. In a sound reproducing machine comprising record supporting and rotating means, a sound box support and a sound box casing yieldingly mounted on the support, the combination of a telephonic circuit including a microphone, one element of which is secured to the casing and the other of which is secured to the support, a receiver actuated by said circuit and sound amplifying means communicating with said receiver.

10. The combination in a sound box, of a casing, a diaphragm mounted therein, a stylus bar connected to the diaphragm, a sleeve on which the casing is supported, sound insulating means between the casing and sleeve, a microphone connected between the casing and sleeve and adapted to convert the relative vibrations therebetween into electrical undulations.

11. The combination in a sound reproducing machine, of a sound box casing, a diaphragm mounted therein, a support for the casing, sound insulating means between the casing and support, means connected between the casing and support to convert the relative vibrations therebetween during the reproduction of sound into electrical undulations and means to convert said electrical undulations into audible sound.

In witness whereof I hereunto set my hand this 7 day of July, 1919.

LEON F. DOUGLASS.

Witnesses:

PETER BACIGALUPI, Jr.,
 M. C. FULLER.