To all whom it may concern:

Be it known that I, SAMUEL S. WATERS, a citizen of the United States, residing at Washington, in the District of Columbia, have invented new and useful Improvements in Apparatus for Recording and Reproducing Sound, of which the following is a specification.

The present invention relates to the art of sound recording and reproducing, and is a division of application Serial Number 393,908 filed July 3, 1920, and has for an object substantially the elimination or material reduction of scratching and other foreign noises in the reproduction, and the synchronous and independent transmission of the various component parts of compound sound reproductions for natural blending in the ears of the hearer to more nearly approach the native and direct sounds, such as; transmission of the voice in song with an instrumental accompaniment, two voices, and various other combinations of sounds which it is desired to reproduce.

Another object is to provide a means for separately and independently recording and reproducing by use of a single machine and single record tablet the sounds of different voices, musical instruments, and the like in any desired combination.

A further object of the invention is to provide a novel transmitter for use in recording and reproducing which is capable of independent operation in different manners under the respective influences of sound waves set up from different sources; the transmitter being capable of variable operation in one manner under the impulses of the sound waves from one source, and capable of variable operation in a totally different manner under the impulses of the sound waves from an entirely different source without conflict or interdependence with the first-mentioned operation.

The above, and various other objects and advantages of this invention, will in part be described in, and in part be understood from the following detailed description of the present preferred embodiment of the invention, the same being illustrated in the accompanying drawings, wherein;

Fig. 1 is a side elevation of a transmitter constructed according to this invention and provided with a stylus shown applied to a record tablet.

Fig. 2 is a top plan view of the same, parts being broken away.

Fig. 3 is an outer end view of the transmitter, showing one manner in which the stylus holder may be mounted.

Fig. 4 is a detail enlarged sectional view through the stylus holder and its universal support.

Fig. 5 is a detail enlarged perspective view of the stylus holder and its right angular connections for the separate sound boxes of the transmitter.

Fig. 6 is a fragmentary enlarged edge view of the record tablet, showing in dotted lines the undulated bottom wall of the sound groove produced by relatively vertical impulses of the stylus.

Fig. 7 is a fragmentary enlarged top plan view of the record tablet, showing the undulating lateral walls of the sound groove produced by relatively horizontal impulses of the stylus.

The present invention embodies a novel apparatus for recording two or more different series of sounds on a record tablet entirely separate and independent of one another and for reproducing the separate series of sounds in a like manner.

In Figs. 1 to 5 of the drawings there is shown a novel form of transmitter constructed according to this invention and which may be used in either recording or reproducing.

The transmitter embodies two sound boxes 20 and 21 of any approved construction, and which, while arranged at right angles to each other, are designed to operate as separate and distinct units. Each sound box has a diaphragm 22 from the central portion of which projects a connecting rod; a rod 23 for the sound box 20 and a rod 24 for the sound box 21. Tone arms 25 and 26 are provided for the respective sound boxes 20 and 21 and may be supported in any suitable manner.

A stylus holder 27 is supported in proximity to the sound boxes, and, as shown, may be mounted on a bracket arm 28 secured to a lug 29 on one sound box 21. The bracket arm 28 has a fork 30 on its free end within which is pivoted on screws or pins 31 a ring 32 adapted to turn into
and out of the plane of the fork 30. The ring 32 may have trunnions or bosses 33 projecting therefrom at diametrically opposite points for receiving the pins 31.

The stylus holder 27 extends at its inner end through the ring 32 and is of less diameter than the ring for free movement therein. The ring carries a pair of opposed pins or screws 34 constituting pivots which are arranged in a plane at right angles to the pivots 31 and which project inwardly and engage the holder 27 and support the latter for pivotal movement in a plane at right angles to the plane of movement of the ring 32.

The holder 27 thus has two entirely distinct and independent movements in planes at right angles to each other, and, consequently, has a universal mounting in proximity to the sound boxes.

The inner end of the stylus holder 27 is connected by a bar 35 to the rod 23 of the sound box 20, and the bar is rigid in one direction for transmitting vibrations in that direction from the holder 27 to the diaphragm 22 but is yieldable in a right angular direction so as not to transmit vibrations in the latter direction to the same diaphragm.

The inner end of the stylus holder is also connected to the rod 24 of the sound box 21 by a second bar 36 which is rigid for movement in the direction of flexing of the first bar 35 and which is yieldable in a right angular direction, or in the direction in which the first bar 35 is rigid for movement.

Thus the bars 35 and 36 operate at right angles to each other for transmitting vibrations in one direction to one sound box only and vibrations in a right angular direction to the other sound box only.

The bars 35 and 36 may be of any suitable construction and material, and may be made of sheet metal strips corrugated transversely so as to freely head off flex in the directions of their faces and so as to be rigid under edgewise pressure. Of course, the bars 35 and 36 may be secured to the holder 27 in any suitable manner, as by welding, and with the bars lying in the respective planes of the directions of vibrations to be selectively transmitted. As shown, the bars 35 and 36 are secured edgewise against the sides of the holder 27 and extend edgewise therefrom in planes intersecting at the longitudinal axis of the holder.

A stylus 37 is mounted in the holder and is adapted to engage a record tablet 38 supported on a turntable 39 of the ordinary phonograph type.

In Figs. 1, 6 and 7 is shown a record tablet 38. The record tablet 38 has a sound groove of the general spiral form and of what may be termed a compound type or wherein the bottom wall 41 is of undulating form to effect vertical vibrations of the stylus, and wherein the side walls 42 are of undulating form to effect the horizontal vibrations of the stylus. This structure of record tablet is adapted to independently vibrate the stylus in two different directions for transmitting the separate series of vibrations to the independent sound boxes 20 and 21.

In the recording of separate series of sounds the transmitter receives the separate sounds and operates upon the needle holder to cut a transversely undulating groove corresponding to one series of sounds in one sound box and a vertically undulating groove corresponding to the other series of sounds in the other sound box.

Each series of sounds is, therefore, independently transmitted to the ears of the hearer and is true and full in tone and unimpaired by interference in vibrations or mechanical defects arising from the merging of the undulations in the sound groove and other obstacles encountered in the structure and operation of apparatus now known in the art.

The result is that the separate sounds are delivered as such to the ears of the hearer and the blending takes place only in the ears in the most perfect and natural manner.

It is obvious that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims:

What is claimed is:

1. In a graphophone, a pair of sound boxes arranged at right angles to each other, a stylus holder, means for supporting the stylus holder for universal pivotal movement, a member freely bendable in one axial plane and rigid in an intersecting axial plane connecting the stylus holder to one sound box and arranged in position to transmit vibrations from the stylus holder to the sound box upon imposition of forces in said intersecting axial plane of the member, said member being adapted to yield upon imposition of lateral forces in said first axial plane thereon to absorb vibration between the stylus holder and the sound box, and a second similar member connecting the stylus holder to the other sound box and arranged to bend in a plane at right angles to the plane of bending of the first member and adapted to transmit forces imposed in the intersecting axial plane of said second member and adapted to absorb vibrations imposed laterally in said first axial plane of the second member.

2. In a graphophone, a record tablet having a compound sound groove, a pair of in-
dependently operable sound boxes, an independent amplifier for each sound box and means including a stylus connected to both of said sound boxes for transmitting one series of vibrations initiated by said record tablet to one sound box and a second independent series of vibrations initiated by said record tablet to the second sound box said means relatively to each sound box being rigid in one direction for transmitting vibrations and being flexible in the opposite direction for absorbing the vibrations.

3. In a graphophone, a pair of diaphragms arranged at an angle to each other, a stylus holder, means for supporting the stylus holder for universal pivotal movement, a flat bar connecting the stylus holder to one sound box and arranged in position to transmit vibrations from the stylus holder to the sound box upon imposition of edgewise forces on the bar, said bar being adapted to yield upon imposition of lateral forces thereon to absorb vibration between the stylus holder and the sound box, and a second flat bar connecting the stylus holder to the other sound box and arranged in a plane at an angle to the plane of the first bar and adapted to transmit forces imposed edgewise upon the second bar and adapted to absorb vibrations imposed laterally upon the second bar.

4. In a graphophone, a pair of independently operable sound boxes, a stylus holder mounted for universal movement in proximity to the sound boxes, and a pair of bars secured at one end to the stylus holder at an angle to each other and secured at their other ends respectively to the sound boxes, said bars being laterally yieldable and rigid in edgewise direction, whereby vibrations of the stylus holder in one direction may be transmitted to but one of said sound boxes and vibrations of the stylus holder in an angular direction may be transmitted only to the other sound box.

5. In a graphophone, a pair of sound boxes arranged at right angles to each other, a stylus holder, means for supporting the stylus holder for universal pivotal movement, and one way flexible and opposite way rigid connecting members between the stylus holder and the sound boxes, said connecting members being arranged to operate at right angles to each other for operating the selected sound box when the stylus is vibrated in the other direction, said flexible connecting members being adapted to absorb the vibrations between the stylus holder and the unselected sound boxes to prevent operation thereof.

6. In a graphophone, a pair of diaphragms arranged at an angle to each other, a stylus holder, and corrugated bars flexible in one direction and rigid in the opposite direction having their corrugations arranged at an angle to each other connecting the stylus holder with the diaphragms and arranged to communicate responses from the stylus holder to the selected diaphragm and absorbing the vibrations between the holder and the unselected diaphragm.

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