May 13, 1930. W. F. CROLL 1,758,559

SOUND RECORDING AND REPRODUCING APPARATUS

Filed Dec. 8, 1927 4 Sheets-Sheet 1

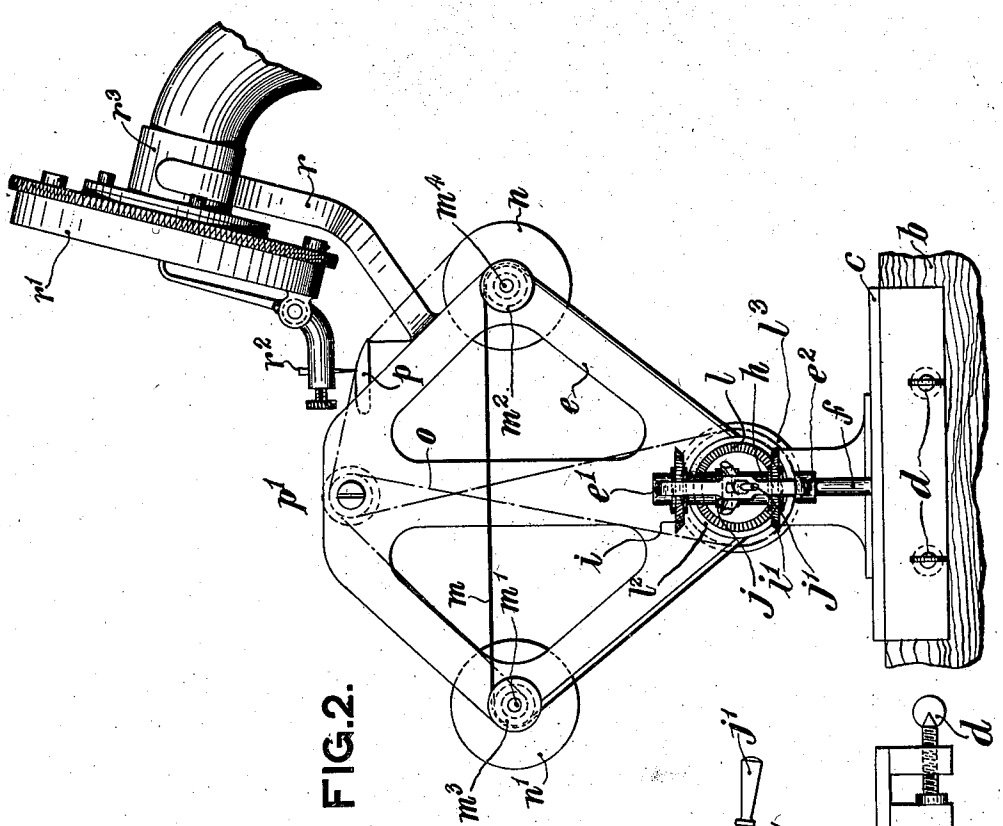


FIG. 2.

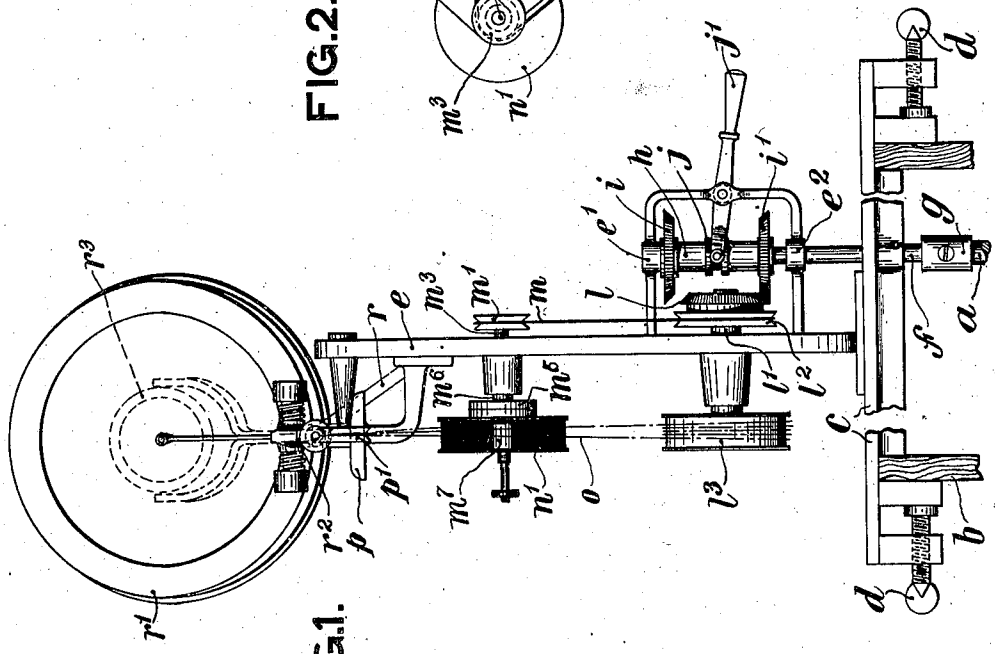


FIG. 1.

Inventor.
William Frederick Croll.
Attorney.

May 13, 1930. W. F. CROLL 1,758,559

SOUND RECORDING AND REPRODUCING APPARATUS

Filed Dec. 8, 1927 4 Sheets-Sheet 2

FIG.3.

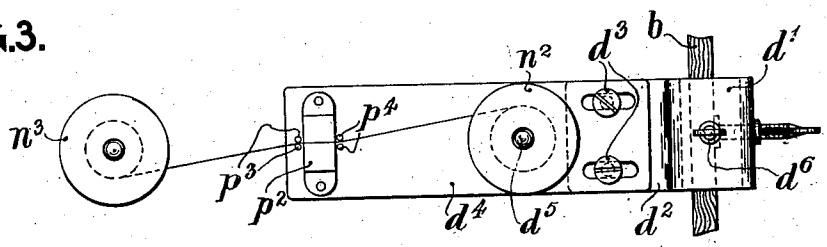


FIG.4.

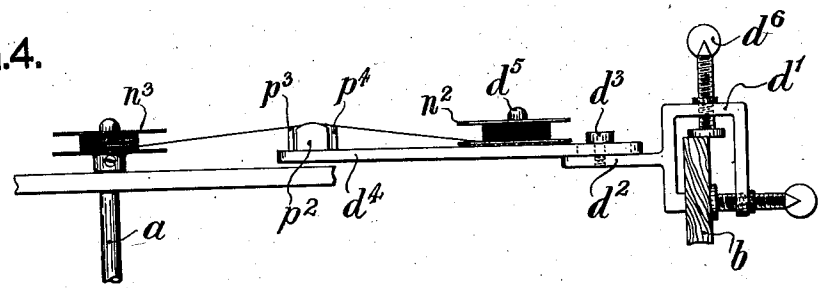


FIG.5.

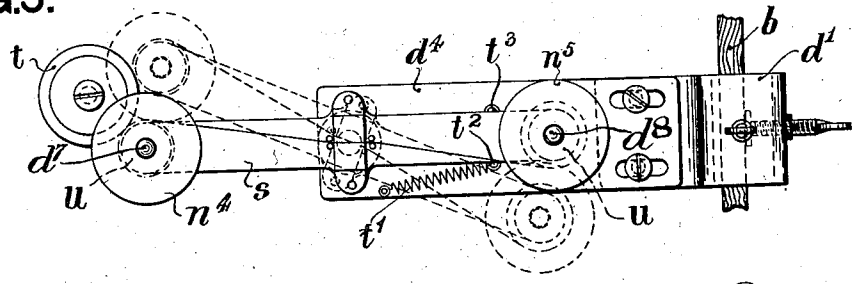
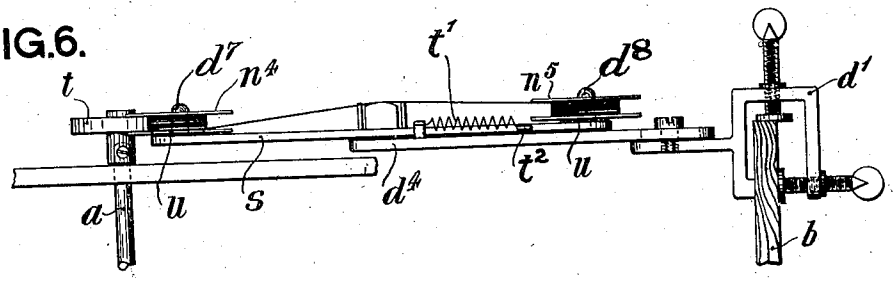


FIG.6.



Inventor.
William Frederick Croll.
Attorney. Thurston

May 13, 1930. W. F. CROLL 1,758,559

SOUND RECORDING AND REPRODUCING APPARATUS

Filed Dec. 8, 1927 4 Sheets-Sheet 3

FIG.7.

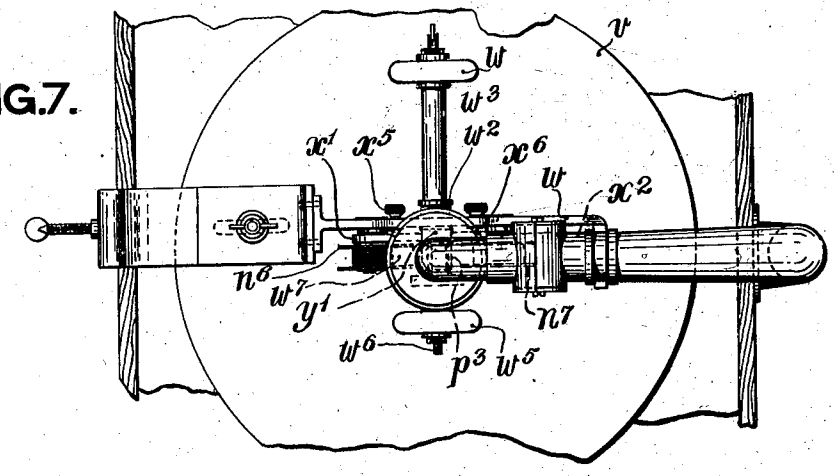


FIG.8.

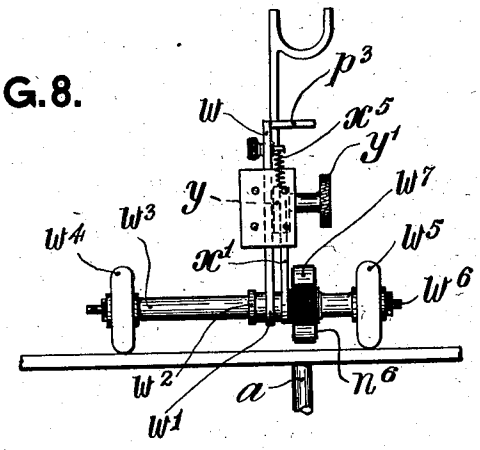
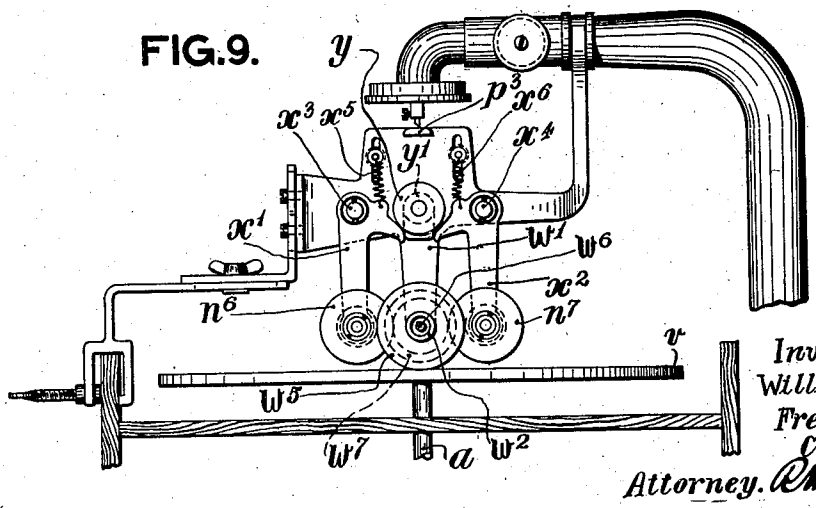


FIG.9.



Inventor.
William
Frederick.
Croll.
Attorney.

May 13, 1930. W. F. CROLL 1,758,559

SOUND RECORDING AND REPRODUCING APPARATUS

Filed Dec. 8, 1927 4 Sheets-Sheet 4

FIG.10.

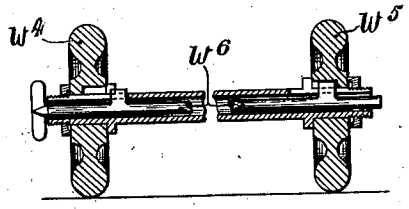
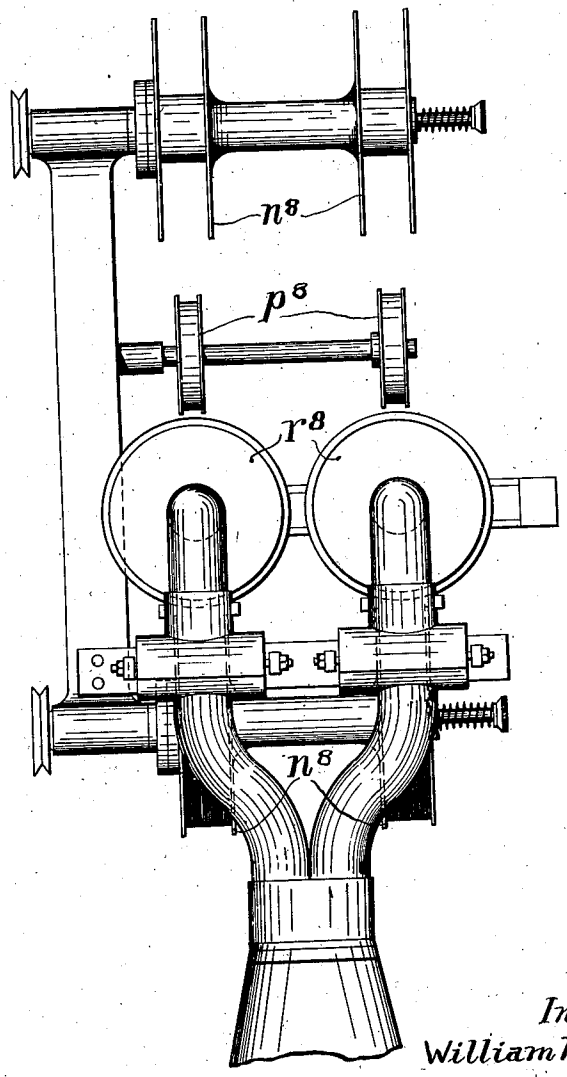


FIG.11.



Inventor:
William Frederick Croll.
Attorney.

Patented May 13, 1930 1,758,559

UNITED STATES PATENT OFFICE

WILLIAM FREDERICK CROLL, OF LONDON, ENGLAND

SOUND RECORDING AND REPRODUCING APPARATUS

Application filed December 8, 1927, Serial No. 238,584, and in Great Britain December 13, 1926.

This invention relates to sound recording and reproducing apparatus, such for example as gramophones, and provides an attachment adapted to be fitted to the driving spindle or other moving member of the apparatus to enable it to operate sound records produced on thread, wire, paper, ribbon or like material which is capable of being wound up and unwound over a supporting member and in contact with a stylus or like device in connection with a sound box.

According to one form of this invention a frame or support adapted to be placed or fitted upon a stationary portion of the apparatus carries a main spindle provided with means by which it may be attached to a driving member of the gramophone or like apparatus, and a pair of driven spindles on which reels can be fitted to carry a winding record, the reel spindles being driven through pulleys or like gearing while the record is fed by separate gearing from one reel to the other. The reel spindles are preferably driven by a band passing over pulleys on the spindles and over a central driving pulley on an intermediate shaft driven by the main spindle, the drive of these pulleys being independent of the drive of the record which passes over and around a separate roller on the intermediate shaft, or preferably over this roller and a second jockey roller which helps to retain the record in place and to give sufficient grip to effect its drive. The drive for the reels is frictional, the reels being preferably mounted rotatably upon their spindles and held by friction discs at one end of the bobbins so that the record is wound up on the reel which is initially empty, under a tension which is given by the friction disc acting on this reel, the spindle which effects the winding up of the record being driven somewhat faster than is necessary to take up the slack of the record. The speed of the record is controlled by the roller on the intermediate shaft over which roller the record passes, and the speed of which roller has a definite relation to the motor speed. The gearing between the main spindle and the intermediate shaft is preferably of bevel type.

The main support of the fitting comprises a light platform with a frame to carry the reel spindles and provided at the centre with a bearing through which the driving spindle extends, the lower end of this spindle being notched or otherwise formed to engage, for example, the usual driving spindle of the gramophone, phonograph or dictating machine, while the platform is adapted to be clamped on the casing of the sound reproducing apparatus under consideration. The fitting is also provided with a rigid support or backing for the record at the point at which the sound reproducing device or stylus bears upon the record as this travels past the sound box. As applied to an ordinary gramophone all that would be necessary to utilize the gramophone for the recording or reproduction of sound by the thread, wire, ribbon or like wound record would be to support the adapter above the turntable and connect it to the spindle. Or the turntable might be removed if found preferable.

By suitable adaptation of the fitting two or more records could be simultaneously used to combine, for example, two or more separately recorded voices or instruments in a musical or dramatic performance.

The bevelled gearing is so contrived that the drive may be reversed so that the motor of the gramophone may also be used for winding back the record after use.

In a modification of this apparatus more especially for thread records one of the bobbins may be mounted directly on the gramophone spindle and the other bobbin carried by an arm connected by a clamp to the gramophone casing, the said arm also carrying the support over which the thread record passes, the latter being passed between guide pins on the arm.

In a further modification a friction wheel may be mounted on the gramophone spindle adapted to take into the space between the flanges of one of the bobbins and drive the latter by friction against the record thread wound thereon. The two bobbins are mounted one on each end of a centrally pivoted beam carrying the support over which the thread record passes. The beam is pivoted on an arm adapted to be clamped to the gramophone casing wall or on a plate capable of ad-

justment on the said arm. By rocking the beam into the one or other position the one bobbin or the other will frictionally contact with the friction wheel on the gramophone spindle and the record thread will be wound or wound back accordingly. Felt or like pads under the bobbins supply sufficient frictional resistance to the bobbins.

In a further modification, the usual gramophone turntable is employed to drive the mechanism of the attachment. The bobbins are frictionally driven from a friction wheel with which either bobbin may be allowed to contact while the other is maintained out of contact by means of a cam. The friction wheel is mounted on a spindle on which are two running wheels, either of which may be keyed to the spindle to revolve it. These running wheels contact with the face of the gramophone turntable, the one being on one side of the axis and the other on the other side of the axis. One of these running wheels is intended to be used for rewinding and is further than the other from the axis of the turntable.

Reference being made to the accompanying drawings Fig. 1 is a side elevation and Fig. 2 a part elevation of the first described form of this invention. Fig. 3 is a plan and Fig. 4 is a side elevation of a modification in which one of the bobbins is mounted on the gramophone spindle. Fig. 5 is a plan and Fig. 6 a side elevation of another modification in which the bobbins are mounted on a rocking beam so that either of them may be driven from a friction wheel mounted on the gramophone spindle.

Fig. 7 is a plan, Fig. 8 a side elevation and Fig. 9 a front elevation of a modification in which the turntable of the gramophone is utilized for driving the bobbins through friction gearing. Fig. 10 is a detail view of part thereof.

Fig. 11 is a plan view of such an apparatus in which arrangement is made for simultaneous operation of two record threads or strips.

Referring to Figs. 1 and 2 a indicates the gramophone spindle and b the gramophone casing. A platform c placed across the casing is clamped thereon by any convenient form of clamps such as d d. Mounted on the platform c is a frame e of any convenient shape having bearings as at e^1 e^2 for a spindle f having means of attachment conventionally shown at g for connection to the spindle a. A sleeve h keyed on the spindle f carries two bevelled pinions i i^1 and a collar j for a striking gear j^1. Either of the pinions i i^1 may be caused to mesh with the bevelled wheel l on a shaft l^1 carrying a belt pulley l^2 and a thread or strip feed wheel l^3. The belt pulley l^2 is connected by belt m with two belt pulleys m^1 m^2 on shafts m^3 m^4 respectively having fixed on them disks m^5 frictionally driving disks m^6 on sleeves m^7 on which the bobbins n n^1 are respectively placed. The record thread o shown as carried by these bobbins n n^1 is passed as shown by dot and dash line in Fig. 2 from bobbin n over the support p, over guide wheel at p', thence under the feed wheel l^3, thence back over the guide wheel at p^1 to the bobbin n^1. The speed of the bobbins n, n^1 which are loose on their respective spindles, is determined by the speed of the feed wheel l^3 fast on the intermediate shaft l^1, the receiving bobbin being caused to maintain a taut thread between it and the feed wheel l^3, and the delivery bobbin by reason of its rotation in the opposite direction to that of its spindle, ensuring a tensioned thread between it and the feed wheel l^3. An arm r on the frame e carries the sound box r^1 with its stylus r^2 bearing on the record thread where it passes over the support p. The sound box throat r^3 may be connected by a flexible tube to the gramophone horn (not shown).

Referring to Figs. 3 and 4, the clamp d^1 has a lug d^2 on which is secured as by set screws d^3, a slotted plate d^4 on which is a pin d^5 to receive one of the bobbins n^2. The support p^2 is also carried by the plate d^4, the record thread being guided to and from the support p^2 by two pairs of pins p^3 p^4. The other bobbin n^3 is mounted directly on the gramophone spindle a. The screw d^6 in the clamp d^1 serves to adjust the height of the device in order that it may be used with gramophones having different heights of casing.

Referring to Figs. 5 and 6, a clamp similar to that in Figs. 3 and 4 carries a plate d^4 on which is pivoted the rocking arm s having near each end a pin d^7 d^8 for reception of the bobbins n^4 n^5. The arm s carries also the support for the record thread and guide pins therefor as in Figs. 3 and 4. On the spindle a of the gramophone is mounted a friction wheel t. The arm s is drawn by a spring t^1 so that one of the bobbins n^4 or n^5 is held in contact with the wheel t. The spring t^1 is detachably hooked to the arm and may be connected to either of two eyes t^2 t^3 according to the position of the arm s. Friction pads u u are placed under the bobbins.

Referring to Figs. 7 to 10 v represents part of the turntable of a gramophone. w is a frame supported in any suitable manner from the gramophone casing and having a downwardly projecting leg w^1 with a bearing w^2 for a hollow shaft w^3 on which two running wheels w^4 w^5 are free to revolve. The shaft w^3 is slotted in the neighbourhood of the wheels w^4 w^5 and keys carried by a pin w^6 within the shaft w^3 project through the slots and are adapted to engage in key ways in either of the wheels w^4 w^5 according to the position of the pin w^6 so as to key one or the other of two wheels w^4 w^5 to the shaft w^3. The shaft w^3 also carries a fric-

tion wheel w^7 adapted to enter between the flanges of either of the bobbins n^6 n^7 and press against the windings of record thread thereon. The bobbins n^6 n^7 are carried by bell crank levers x^1 x^2 pivoted at x^3 x^4 respectively on the frame w. Springs x^5 x^6 tend to draw the bell crank levers x^1 x^2 so as to press the bobbins against the friction wheel w^7. A cam y pivoted on the frame w and operated by a knurled knob y^1 is adapted to bear against the one or other bell crank lever x^1 x^2 and hold the corresponding bobbin away from the friction wheel w^7. The support for the thread is indicated at p^3.

It will be understood that the stylus of the reproducer is adapted to bear on the thread as it passes over the thread support in any of the Figures 3 to 9, in the same manner as shown in Figs. 1 and 2, whether the sound reproducer be of the type shown in Figs. 1 and 2 or of the type shown in Fig. 9.

In the modification illustrated in Fig. 11, the reels (equivalent to n n^1 of Figs. 1 and 2) for giving out and receiving the record respectively are each duplicated as shown at n^8 n^8 and the record driving wheel (equivalent to l^3 of Figs. 1 and 2) is also duplicated as at p^8. There are two sound reproducers as shown at r^8. The remainder of this apparatus is the same as has been described with respect to Figs. 1 and 2 and has therefore been omitted from this figure.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. In sound reproducing or recording apparatus the combination of a sound box and stylus, means for feeding a record strip in contact with said stylus, a holder for said sound box and feeding means, a device for engaging said feeding means with a rotating part of an instrument of the gramophone type, whereby said feeding means are actuated, and means for attaching said holder to said instrument, with said actuating device in engagement with said rotating part.

2. In sound reproducing or recording apparatus the combination of a sound box and stylus, means for feeding a record strip in the form of a thread in contact with said stylus, a holder for said sound box and feeding means, a device for engaging said feeding means with a rotating part of an instrument of the gramophone type, whereby said feeding means are actuated, and means for attaching said holder to said instrument, with said actuating device in engagement with said rotating part.

3. In sound reproducing or recording apparatus the combination of a sound box and stylus, means for feeding a record strip in either direction at will, a holder for said sound box and feeding means, a device for engaging said feeding means with a rotating part of an instrument of the gramophone type, whereby said feeding means are actuated, and means for attaching said holder to said instrument, with said actuating device in engagement with said rotating part.

4. In sound reproducing or recording apparatus the combination of a sound box and stylus, means for feeding a record strip in the form of a thread in either direction at will, a holder for said sound box and feeding means, a device for engaging said feeding means with a rotating part of an instrument of the gramophone type, whereby said feeding means are actuated, and means for attaching said holder to said instrument, with said actuating device in engagement with said rotating part.

5. In sound reproducing or recording apparatus the combination of a sound box and stylus, means for feeding a record strip in contact with said stylus, a holder for said sound box and feeding means, a device for engaging said feeding means with a rotating spindle of an instrument of the gramophone type, whereby said feeding means are actuated, and means for attaching said holder to said instrument, with said actuating device in engagement with said spindle.

6. In sound reproducing or recording apparatus the combination of a sound box and stylus, means for feeding a record strip in the form of a thread in contact with said stylus, a holder for said sound box and feeding means, a device for engaging said feeding means with a rotating spindle of an instrument of the gramaphone type, whereby said feeding means are actuated, and means for attaching said holder to said instrument, with said actuating device in engagement with said spindle.

7. In sound reproducing or recording apparatus the combination of a sound box and stylus, means for feeding a record strip in contact with said stylus, a holder for said sound box and feeding means, a device for engaging said feeding means with a rotating turntable of an instrument of the gramaphone type, whereby said feeding means are actuated, and means for attaching said holder to said instrument, with said actuating device in engagement with said turntable.

8. In sound reproducing or recording apparatus the combination of a sound box and stylus, means for feeding a record strip in either direction at will, a holder for said sound box and feeding means, a device for engaging said feeding means with a rotating turntable of an instrument of the gramophone type, whereby said feeding means are actuated, and means for attaching said holder to said instrument, with said actuating device in engagement with said turntable.

9. In sound reproducing or recording apparatus the combination of a sound box and

stylus, a pair of bobbins for a record strip, means for rotating said bobbins for feeding said record strip in contact with said stylus, a holder for said sound box, bobbins and feeding means, a device for engaging said feeding means with a rotating part of an instrument of the gramophone type, whereby said feeding means are actuated to rotate said bobbins, means for attaching said holder to said instrument, with said actuating device in engagement with said rotating part, and means automatically regulating the relative speeds of the two bobbins as the record strip is fed from the full one to the empty one.

10. In sound reproducing or recording apparatus the combination of a sound box and stylus, a pair of bobbins for a record strip, means for rotating said bobbins in either direction at will for feeding said record strip, a holder for said sound box, bobbins and feeding means, a device for engaging said feeding means with a rotating part of an instrument of the gramophone type, whereby said feeding means are actuated, to rotate said bobbins, means for attaching said holder to said instrument, with said actuating device in engagement with said rotating part, and means automatically regulating the relative speeds of the two bobbins as the record strip is fed from the full one to the empty one.

11. In sound reproducing or recording apparatus the combination of a sound box and stylus, a pair of bobbins for a record strip, means for rotating either of said bobbins in either direction at will for feeding said record strip, a holder for said sound box, bobbins and feeding means, a device for engaging said feeding means with a rotating turntable of an instrument of the gramophone type, whereby said feeding means are actuated and means for attaching said holder to said instrument, with said actuating device in engagement with said turntable.

12. In sound reproducing or recording apparatus the combination of a sound box and stylus, a pair of bobbins for a record strip, means for rotating either of said bobbins in either direction at will for feeding said record strip, said means consisting of running wheels adapted to contact with a rotating turntable of an instrument of the gramophone type, a holder for said sound box, bobbins and feeding means and means for attaching said holder to said instrument, with said running wheels in contact with said turntable.

13. In sound reproducing or recording apparatus the combination of a plurality of sound boxes and stylus, means for feeding a plurality of record strips in contact with said stylus, a holder for said sound boxes and feeding means, a device for engaging said feeding means with a rotating part of an instrument of the gramophone type, whereby said feeding means are actuated, and means for attaching said holder to said instrument, with said actuating device in engagement with said rotating part.

In witness whereof I have signed this specification.

WILLIAM FREDERICK CROLL.