

March 28, 1939.

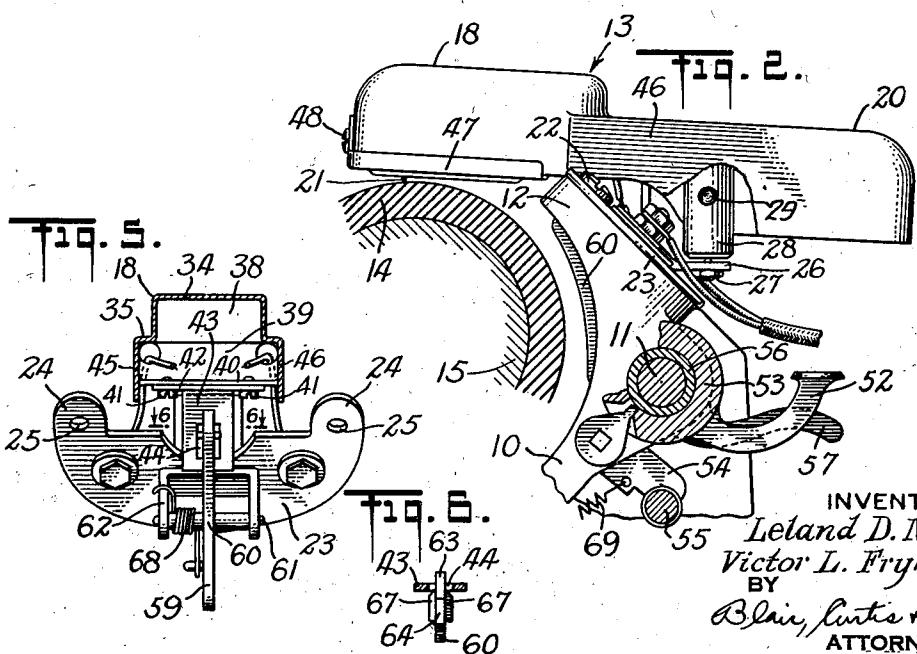
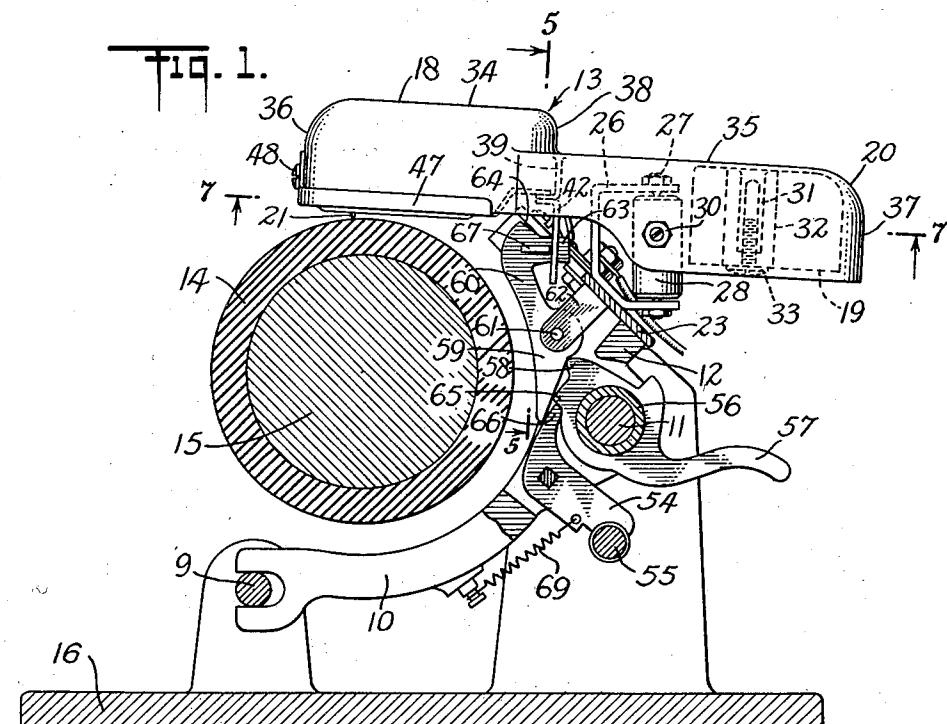
L. D. NORTON ET AL

2,152,440

COMMERCIAL PHONOGRAPH

Filed Oct. 4, 1935

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 3.

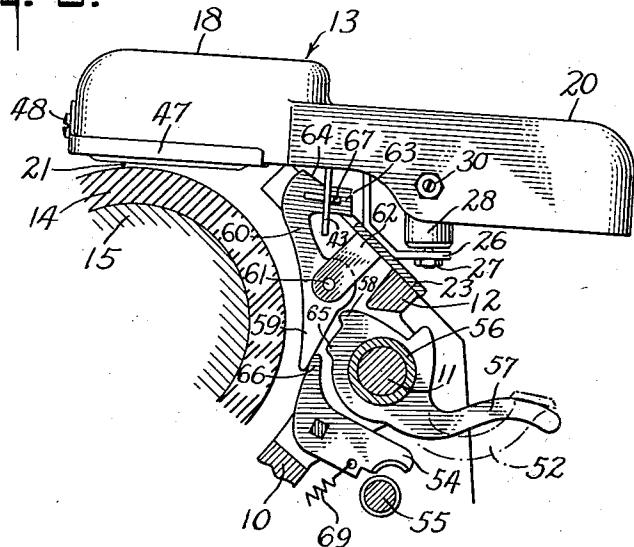
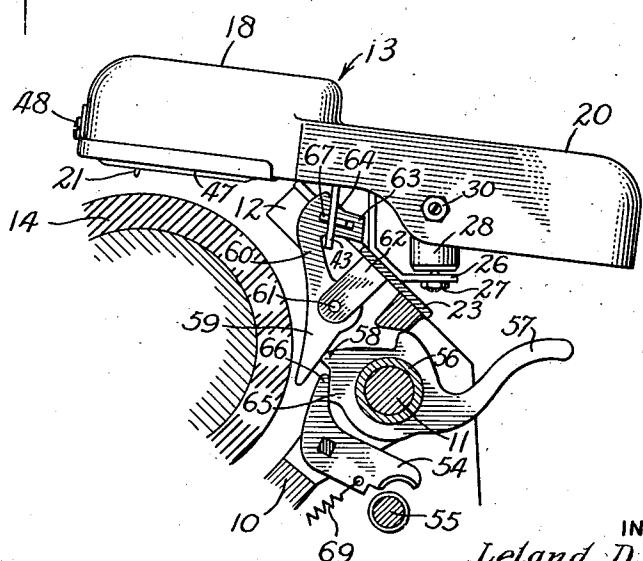


Fig. 4.



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## UNITED STATES PATENT OFFICE

2,152,440

## COMMERCIAL PHONOGRAPH

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Application October 4, 1935, Serial No. 43,576

4 Claims. (Cl. 274—21)

This invention relates to commercial phonographs, and more particularly to such machines of the transcribing type.

An object of the invention is to provide a machine of the character described adapted through the utilization of electro-magnetic means efficiently to reproduce a sound record. A further object is to provide simple and effective means for controlling the reproducing stylus in respect to position and freedom of movement relative to the sound record tablet. Other objects will be in part obvious and in part pointed out hereinafter.

In the drawings, which illustrate one embodiment of the invention:

Fig. 1 is a side elevation partly in section, showing the reproducer supported by its carriage, feeding means for the carriage, and means for controlling the reproducer and feeding means, the said parts being shown in the positions they occupy when the machine is conditioned for operation;

Fig. 2 is a side elevation partly in section showing means for backspacing the carriage and means for controlling the reproducer and feeding means while backspacing;

Fig. 3 is a fragmentary view showing the reproducer and control elements in the positions they occupy during backspacing;

Fig. 4 is a similar view showing the reproducer and control elements in the positions they occupy when the machine is in an inoperative condition;

Fig. 5 is a sectional view taken on line 5—5 of Fig. 1;

Fig. 6 is a sectional view taken on line 6—6 of Fig. 5.

The phonographic machine shown in the accompanying drawings for the purpose of illustrating the invention is a transcribing machine having a carriage 10, mounted upon guide rods 9 and 11, and comprising a head 12 adapted to support a reproducer or pick-up unit 13, for reproducing sound recorded upon a record cylinder 14, mounted in a well known manner upon a rotatable mandrel or record support 15. Carriage, guide rods, mandrel, and driving mechanism (not shown) are all suitably mounted upon a frame 16, also of well known construction.

The reproducer unit comprises an electro-magnetic translation device supported within a housing 18, and an adjustable counterweight 19, supported within a forward extension 20 of said housing, Fig. 1. The translation device comprises a vibratory stylus 21, and the reproducer is pivotally mounted on the carriage in a manner to permit limited movement in a vertical plane,

whereby the stylus may be moved into or out of engagement with the record cylinder and is further pivotally mounted for oscillatory movement about a substantially vertical axis to permit the stylus freely to track the record sound groove when the machine is conditioned for reproducing operation.

Movement of the reproducer about its horizontal axis not only permits removal of the stylus from the record surface, but also during operation of the machine permits the stylus supporting parts to accommodate themselves to records of various thicknesses and to inequalities in the record surface. The carriage head 12 has secured thereto by means of studs 22 (see Fig. 2) an approximately semicircular top plate 23, best seen in Fig. 5, provided with extending lugs 24 having holes 25 formed therein for the reception of the said studs 22, the latter having threaded engagement with the carriage head. A bracket member 26 secured to the upper surface of plate 23 provides upper and lower arms between which is pivoted by means of adjustable pivot points 27 a vertically disposed arbor 28. The latter member has laterally extending portions which constitute a horizontally disposed arbor 29 (see Fig. 2) pivotally mounted between aligned pivot members 30, adjustably mounted in the side walls of the housing extension 20. Thus, the reproducer unit is universally mounted for limited up-and-down and lateral movement.

An internally threaded lug 31 extends down from the top wall of the housing extension 20. The counterweight 19 is slotted as indicated at 32 in Fig. 1. A cap screw 33 engaging the threads of the lug 31 serves to hold the counterweight in any selected position of adjustment.

The housing 18 comprises a top wall made up of offset portions 34, 35, the rear portion 34 being raised somewhat above the plane of the portion 35. Two end walls 36 and 37 close the rear and front ends respectively of the housing. A wall 38 extending between the offset portions 34, 35 of the top wall may be said to be continued down nearly to the bottom of the housing to provide a partition 39, Fig. 1. At its lower end this partition is flanged, as at 40, and secured to said flange, as by means of cap screws 41, Fig. 5, is a member 42 having a downwardly extending portion 43 in which is formed a rectangular opening 44, the purpose of which will appear hereinafter. Side walls 45, 46 complete the housing, the side walls continuing forwardly beyond the partition 39 at a slightly less distance apart than the dis-

tance between them at points rearwardly of said partition.

The translation device (not shown) fits within the walls of the rear portion of the housing and is supported and protected by means of a removable bottom cover 47 which is provided with flanges taking over the edges of the rear and side walls of the housing. At its forward end, the cover 47 is shaped to slip over the flange of partition 39 and rest thereon. A cap screw 48 secures the rear upturned flange of the cover to the wall 36. This cover is provided with a suitable opening through which the stylus 21 may operate. All parts of the housing as above described are preferably made of cast aluminum, the support member 28, 29 being also composed of that material.

Since the reproducer unit must be capable of operating satisfactorily with new record cylinders and also with those which have been shaved down to a relatively small diameter, it has been found expedient to locate the horizontal axis through pivots 30, 30 in a plane tangent to the periphery of a cylinder of average thickness substantially at the point of contact of the stylus with the cylinder. In the present construction, this is accomplished by dropping the side walls of the forward section of the housing considerably below the bottom plate 47 and locating the pivots 30, 30 approximately in the plane of the lowermost surface of said plate. However, slight removal of the pivot axis above or below this plane may occur without materially affecting the proper functioning of the reproducer.

It frequently occurs in the use of machines of the character described that the operator desires to revert to a portion of the record just passed to verify the transcription or to listen again to some matter not entirely clear. Thus, transcribing machines have heretofore been, and the machine of this invention is, provided with backspacing means comprising a lever 52, Fig. 2, having a hub 53 supported by the reproducer carriage 10 and carrying a pawl (not shown) adapted to cooperate with a toothed rack (not shown). For a more complete understanding of such a backspacing construction, reference may be had to U. S. Patents Nos. 1,030,740 and 1,983,039. It will be understood that when the lever 52 is depressed, the carriage is moved back toward the end of the record cylinder at which the sound record begins. The same operation also raises the feed nut 54 from the forward feed screw 55 to free the carriage therefrom during the backspacing movement.

When it is desired to move the reproducer carriage a relatively long distance along the record, either forward or backward, or when it is desired to change records, it is necessary to lift the stylus clear of the record. To this end, there is mounted on a portion of the carriage sleeve 56, which sleeve also supports the backspace lever 52, a carriage release or reproducer conditioning lever 57, Fig. 1. This lever is so arranged that when the operator raises its forward end, a rearwardly extending cam 58 engages an arm 59 of a lever 60 which is pivoted at 61 upon a support 62 depending from the rear surface of the top plate 23. At its upper end lever 60 is provided with a projection 63 extending forwardly through the opening 44 in the member 43. Normally, when the reproducer is in its operative position as in Fig. 1, the projection 63 is free from contact with all of the four sides of the opening. It will be noted, however, that rearwardly of the member 43 the upper end of lever 60 is provided with a camming surface 64, Figs. 3 and 4, adapted,

when the lever 60 is swung in a clockwise direction by operation of conditioning lever 57, to engage the upper side of opening 44 and thus swing the reproducer about its pivots 30, 30, which movement of the reproducer raises the stylus clear of the record cylinder. At the same time, a second cam 65 formed on lever 57 engages an upward projection 66 of the feed nut 54 and lifts the feed nut out of meshing relation with the feed screw.

When backspacing short distances by means of the backspace lever 52, the stylus need not be lifted from the record cylinder, but be allowed to skid along the record surface. However, in order that the stylus may always occupy at the end of a backspacing movement a central position within its range of swinging movement about the vertical pivots 21, means are provided in the present construction for centralizing the stylus whenever the backspace lever is depressed, the stylus being held in such centralized position until the said lever is again released. This means comprises a pair of vanes 67, 67 disposed one upon each side of the upper end of lever 60, as will be clearly understood by reference to Figs. 1, 5, and 6. These vanes are beveled off at their forward ends to enable them more readily to enter the opening 44 in the plate 43. When the feed nut 54 is lifted from the feed screw by means of the backspace lever, its upper projection 66 moves rearwardly just far enough to engage arm 59 of lever 60 (Fig. 3) and rock lever 60 a sufficient distance to bring the lateral surfaces of the vanes 67, 67 into engagement with the sides of the opening 44; but the lever 60 is not rocked under these conditions far enough to engage the camming surface 64 with the upper side of the opening 44. Thus, at each operation of the backspace device, the stylus is locked in a central position with reference to its range of lateral movement and skids over the surface of the record cylinder in this locked condition.

Fig. 3 of the drawings shows the relation of the various movable stylus control elements under the conditions just described. In Fig. 4, the relation of the same parts is shown when the reproducer and feed nut are raised by manipulation of conditioning lever 57. It will be noted that the centralizing action takes place both when the stylus is raised and when it is backspaced by means of the backspacing mechanism. The lever 60 is resiliently held in its inactive position by means of a spring 68 and the feed nut is normally held in engagement with the feed screw by means of a spring 69.

One of the features of prime importance is the employment in a magnetic type of reproducer of a small magnetic armature mounted to vibrate with a very light non-magnetic support. Thus, the inertia of the moving parts is reduced to a very low value so that when used upon wax records of the usual type used in commercial phonographs, the movement of the vibratory parts may accurately follow the undulations of the sound groove over a very wide range of frequencies and be capable of transmitting accurately the higher frequencies of speech, even up to and above frequencies of six thousand cycles. If the mass of this moving portion of the translation device were high, the stylus would not follow the variations of the sound track rapidly enough, particularly in respect to the higher frequencies, and would tend to scrape off the higher portions of wax in the sound track, thus ruining the recording for further reproduction and, at the same time, producing distortion. After many tests it has been found that optimum results are attained

when the weight of the vibratory member, including the armature and its support, is less than one-half gram. The lead weight 18 used to counterbalance the reproducer unit is, as said above, movable within limits. It has been found best, in relation to such a light armature and support, to adjust the weight on the point of the stylus to a value somewhat below fifteen grams. Wear, frequency characteristics, and the mechanical operating characteristics of the reproducer are all affected by the weight upon the point of the stylus.

It should be noted also that the ratio of the weight of the armature parts and the weight of the reproducer as a whole must, for best results, fall within certain predetermined limits. For, if the weight of the armature and its support is high and its support is stiff, there is a tendency to raise the reproducer as a whole with every undulation of the wax. By a proper determination of the weight and the natural period of vibration of the armature and its support, and the weight and natural period of vibration of the reproducer unit as a whole, the quality of reproduction may be brought to a very high degree of perfection so that little distortion will take place even at the higher speech frequencies and the operation of the reproducer in relation to the wax record be so free from inertia effects as not to cause appreciable damage to the undulations of the record track.

In this description, a portion of a certain form of backspacing device has been illustrated, but it will be understood that other forms of backspacing mechanism may be used without affecting the principles underlying the present invention, and not only may the backspacing be accomplished by manual operation, but also it may be effected automatically by power actuation upon the manipulation of a remote control element. One such backspacing device and remote control is described in the above-mentioned Patent No. 1,983,039.

As many possible embodiments of the present invention may be made without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

We claim:

1. Phonograph apparatus of the type having a carriage movable along a record tablet wherein a stylus is freely movable laterally when in operative position to the record tablet and is movable vertically to and from said position, comprising a carrier for supporting and positioning the stylus, a cam plate on said carrier having a cam engaging downwardly exposed surface and cam engaging laterally exposed surfaces, a cam lever on the carriage having cam means adapted to engage said downwardly exposed surface and separate cam means to engage said laterally ex-

posed surfaces, backspacing means for the carriage including a backspacing lever, stylus carrier lifting means including a lifting lever, and means operatively associated with each of said levers for independently engaging and actuating said cam lever to restrain lateral movement of the stylus. 5

2. Phonograph apparatus of the type having a carriage movable along a record tablet wherein a stylus is freely movable laterally when in operative position to the record tablet and is movable vertically to and from said position, comprising a carrier for supporting and positioning the stylus, a cam plate on said carrier having a cam engaging downwardly exposed surface and cam engaging laterally exposed surfaces, a cam lever having cam means adapted to engage said downwardly exposed surface and separate cam means to engage said laterally exposed surfaces, backspacing means for the carriage including a backspacing lever, stylus carrier lifting means including a lifting lever, means on each of said levers for independently engaging and actuating said cam lever to restrain lateral movement of the stylus, and means on the lifting lever to engage and 20 actuate said cam lever to lift the stylus to inoperative position. 25

3. In a dictation transcribing machine, in combination, a carriage movable along a frame in operative relation to a record tablet, a reproducing stylus, a carrier for said stylus mounted on said carriage for free lateral movement to enable said stylus to track the record and movable vertically to effect engagement or disengagement of said stylus with the record tablet, means on said carrier presenting cam engaging surfaces exposed downwardly and laterally respectively, a lever on said carriage having camming means for engaging said downwardly exposed surface and other camming means for engaging said laterally exposed surface, and means for actuating said lever to move said cams respectively into engagement with said surfaces. 35

4. In a dictation transcribing machine, in combination, a carriage movable along a frame in operative relation to a record tablet, a reproducing stylus, a carrier for said stylus mounted on said carriage for free lateral movement to enable said stylus to track the record and movable vertically to effect engagement or disengagement of said stylus with the record tablet, a cam lever mounted on said carriage having separate camming surfaces thereon, one of which cooperates with means on the carrier to restrain lateral movement thereof, and the other of which cooperates with other means on the carrier to move and hold the stylus out of record engagement, and separate means for selectively moving said lever to render said camming surfaces effective. 50 55

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