March 20, 1951 C. W. DANN ET AL 2,545,652

PHONOGRAPH RECORDER AND REPRODUCER

Filed July 11, 1945 3 Sheets-Sheet 1

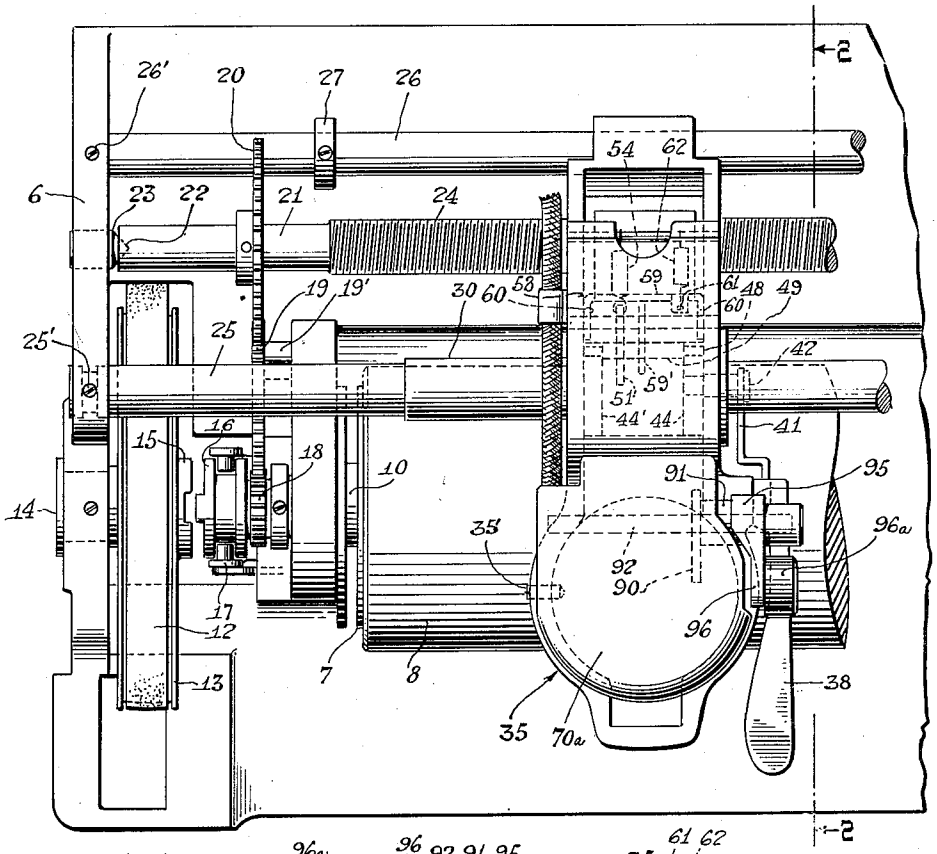


Fig. 1

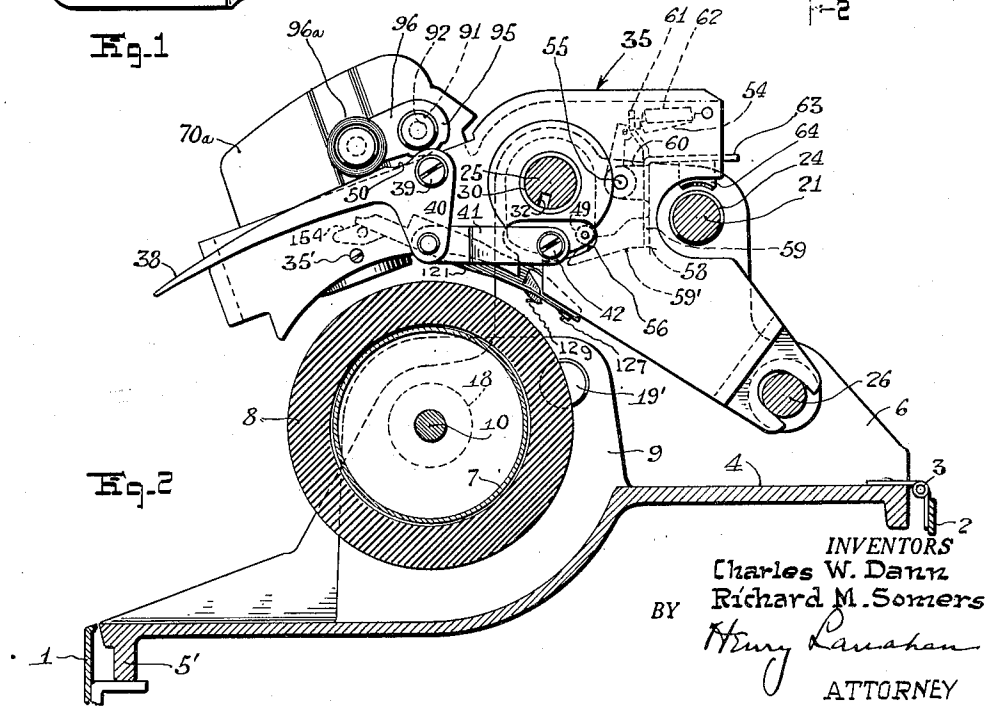


Fig. 2

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PHONOGRAPH RECORDER AND REPRODUCER

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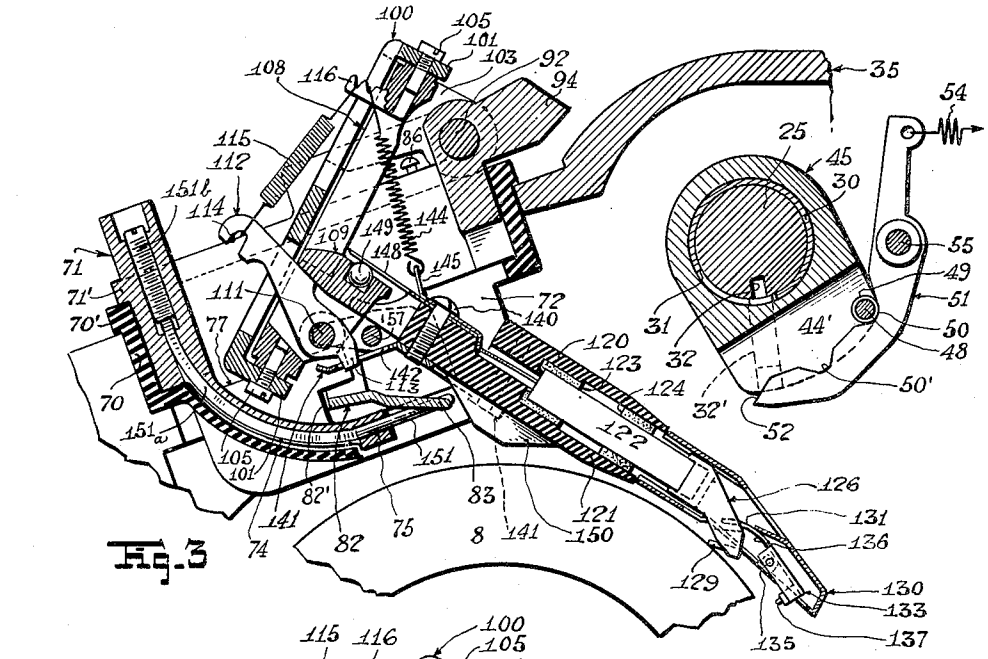


Fig. 3

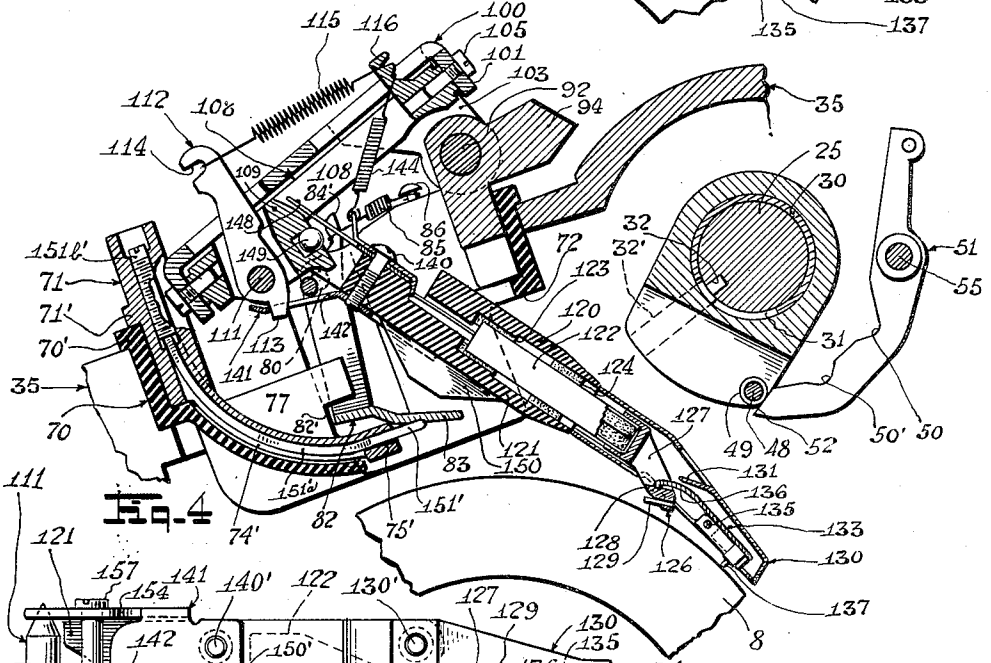


Fig. 4

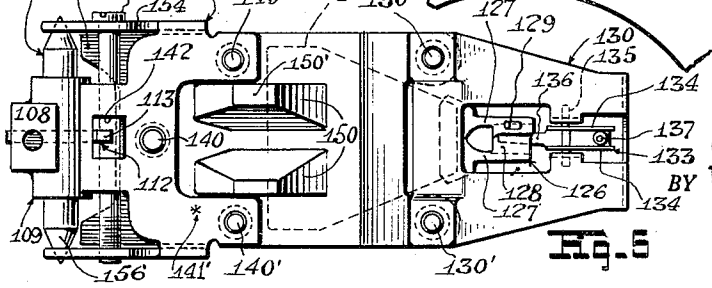


Fig. 5

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PHONOGRAPH RECORDER AND REPRODUCER

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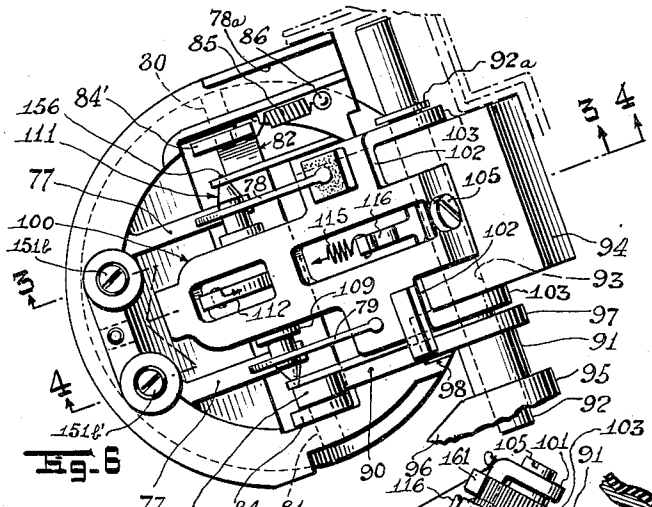


Fig. 6

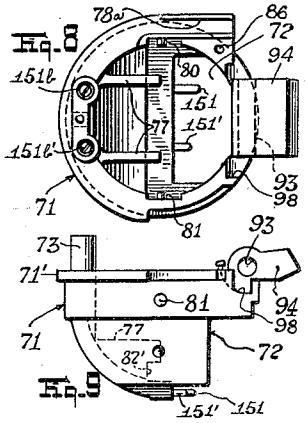


Fig. 8

Fig. 9

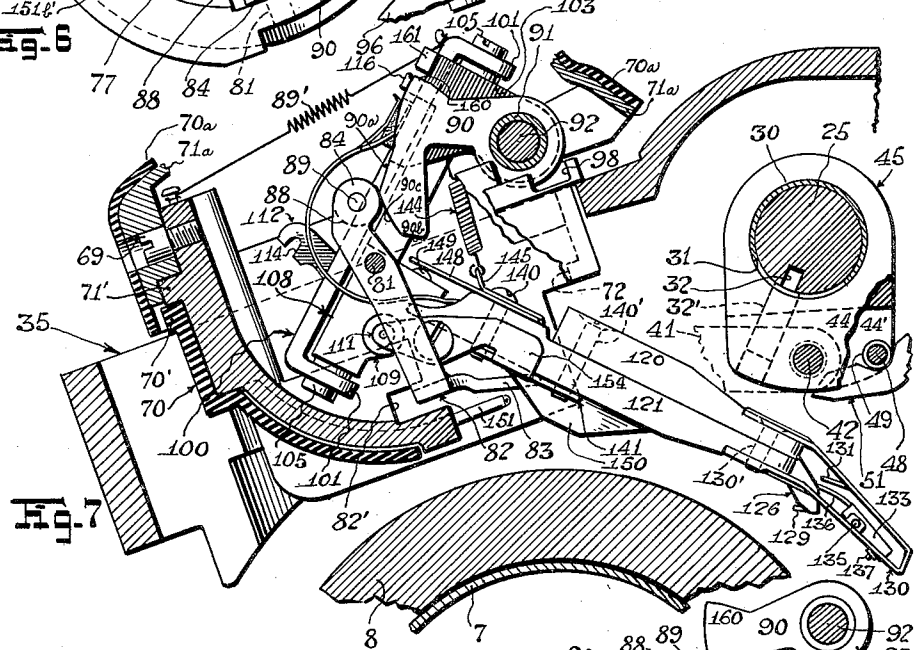


Fig. 7

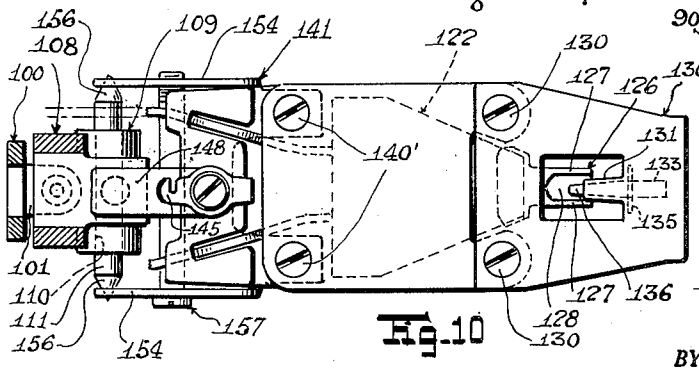


Fig. 10

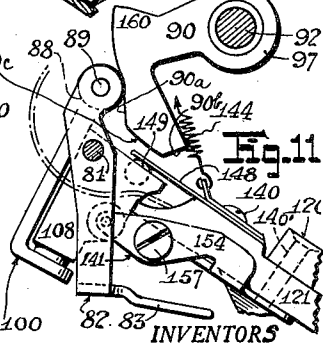


Fig. 11

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UNITED STATES PATENT OFFICE

2,545,652

PHONOGRAPH RECORDER AND REPRODUCER

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Application July 11, 1945, Serial No. 604,316

7 Claims. (Cl. 274—30)

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This invention relates to a phonograph and particularly to a combination recorder and reproducer therefor.

The invention is particularly useful in dictating machines but it is also useful in other types of sound recording and reproducing machines.

One type of such machine is provided with a frame or top plate which supports rods and a feed screw for a carriage. The carriage carries a feed nut that can be engaged with the feed screw for moving the carriage at the desired speed along these rods. A mandrel is provided for mounting a cylinder upon which sound vibrations may be recorded and from which the sound can be reproduced.

This invention may utilize piezoelectric crystals for recording and reproducing sound. The machine in which the invention is to be used may be provided with well-known means for starting and stopping. It is provided with improved means for controlling the conditioning of a recorder-reproducer.

In carrying out the present invention provision is made to damp unwanted vibrations of the recorder-reproducer mechanism when it is in its recording position and also to prevent the styli carried thereby from striking the record carrier when no record is mounted thereon. Provision is also made to permit lateral movement of the recorder-reproducer unit when it is in its reproducing position and to prevent such movement when it is in its recording position. Further provision is also made for obtaining different biasing effects on the recording and reproducing styli when in operating positions. Provision is also made for electrical shielding when the recorder-reproducer is of the electrical type.

Other features and advantages of the invention will be obvious as the description proceeds.

The invention may be understood from the description in connection with the accompanying drawings, in which

Fig. 1 is a plan view of a phonograph partly broken away in which the recorder-reproducer is of the piezoelectric type;

Fig. 2 is an end view, partly in section, of the phonograph shown in Fig. 1, the section being taken on line 2—2 of the latter figure;

Fig. 3 is a vertical section taken along the line 3—3 of Fig. 6 showing the recorder-reproducer unit in recording position;

Fig. 4 is a vertical section taken along the line 4—4 of Fig. 6 showing the recorder-reproducer unit in reproducing position;

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Fig. 5 is a bottom plan view of the recorder-reproducer unit;

Fig. 6 is a plan view showing the recorder-reproducer mechanism housing assembly;

Fig. 7 is a sectional view, with parts in elevation, showing the recorder-reproducer unit in neutral position;

Fig. 8 is a plan view, on a reduced scale, of the housing shown in Fig. 6;

Fig. 9 is a side elevation of the same.

Fig. 10 is a top plan view, partly in section, of the recorder-reproducer unit; and

Fig. 11 is a side view showing some of the details.

In the drawings, reference characters 1 and 2 indicate the upper edge portions of the front and back walls of a cabinet. Hinges 3 are provided along the upper edge of the wall 2 and are connected to a top plate 4. One or more inwardly projecting stops or lugs are provided along the front wall 1 of the cabinet upon which the rib 5' of the top plate 4 normally rests. A pair of integral upwardly projecting standards 6 is provided on the top plate 4. A mandrel 7 carries the cylindrical record 8. Another standard 9 is provided upon the plate 4. One end of the mandrel shaft 10 is journalled in the standard 9, the other end being free.

A belt 12 from a motor, not shown, drives a pulley 13 that is journalled on a stud shaft 14 anchored in standard 6. A clutch member 15 is attached to the pulley 13 and is adapted to be engaged by a mating clutch member 16 that is operated by an arm 17 in the known way to connect the clutch members. A gear 18 on shaft 10 meshes with the gear 19 on a stud shaft 19'. The gear 19 meshes with a gear 20 fixed on shaft 21 which is the feed screw. The feed screw 21 has conical journals 22 in its ends for corresponding studs 23 supported in the standards 6. Feed screw 21 is threaded for a portion 24 of its length. Smooth support rods 25 and 26 are provided that are parallel with the feed screw 21 and are anchored in the standards 6 by holding screws 25' and 26'. Rod 25 is mounted to turn in its bearings and is retained in place by screws 25' which projects onto an annular groove in rod 25. An adjustable stop 27 is provided on the rod 26 and a sleeve 30 is provided on the rod 25. The sleeve 30 is rigidly attached to the recorder-reproducer carriage which is to be described later. An arcuate slot 31 (Figs. 3, 4 and 7) is provided in the sleeve 30. A longitudinal slot 32 is provided in the rod 25. A pin 32' has a reduced end that slides in slot 32 and is adapted to turn the

rod 25 in the sleeve 30 to the extent permitted by the slot 31. For this purpose the pin 32' is screwed into the barrel 45 to be described.

Reference character 35 indicates the carriage of the combined recorder-reproducer. It is slidable along the rods 25 and 26. A control lever 38 (Figs. 1 and 2) is pivoted on pin 39 on a side wall of the carriage 35. This lever has a projection 40 which is pivoted at its lower end to one end of the link 41. The other end of this link is connected by pin 42 (Figs. 1, 2 and 7) to the extension 44 of the barrel 45 that is journalled on the sleeve 30.

Extensions 44 and 44' (Figs. 3, 4 and 7) of the barrel 45 carry a transverse pin 48 on which a roller 49 is mounted.

Notches 50 and 50' are provided in a detent lever 51 pivoted on shaft or rod 55 that is mounted in carriage 35. The roller 49 is adapted to engage these notches and hold the control lever 38 in different positions. The detent lever 51 has a bevelled end 52 against which the roller 49 rests when the arm 38 is raised to its highest position. A spring 54 urges the detent lever 51 in a clockwise direction (Figs. 1, 2, 3 and 4). The ends of a slot 56 (Fig. 2) in the wall of the carriage 35 serve to limit the motion of the control lever 38.

A feed nut lever 58 (Figs. 1 and 2) is pivoted on shaft 55 that is anchored in the side walls of carriage 35. A cross portion 59 of the lever 58 has lugs 60 at its ends by means of which this lever is pivoted on shaft 55. A cam 59' extends forwardly and downwardly from the portion 59 to cooperate with the roller 49. An upward extension 61 (Figs. 1 and 2) is provided on the lever 58 and a tension spring 62 urges the lever 58 in a clockwise direction. The rear extension 63 of the lever 58 carries a feed nut 64.

The present invention embodies an improved recorder-reproducer which may, for example, be of the piezoelectric type and can be located in the carriage 35. It is selectively conditioned for operation by actuating the control lever 38.

A substantially circular metal housing 71 (Figs. 6–9) is provided for the recorder-reproducer. This housing 71 is prevented from electrically contacting other metal parts of the apparatus, particularly the carriage 35 by providing an insulating casing 70 which fits the outer configuration of said housing. The casing 70 has a flange 70' (Fig. 7) resting upon carriage 35 and the housing 71 has a flange 71' resting upon the casing 70 to locate the parts in position in the carriage 35. Both the casing 70 and the housing 71 have similar openings 72 at their bottom (Figs. 3 and 4). The housing 71 is provided with a cover (Fig. 7) comprising an inner substantially circular metal housing 71*a* and an outer insulating casing 70*a*; this cover being removably secured in place on said housing 71 by a screw 69. This housing assembly is mounted in a substantially circular opening in the forward portion of the carriage 35 and is removably held in place by suitable retaining screws 35' (Figs. 1 and 2).

Two similar parallel spaced ribs or rails 77 (Figs. 3, 4, 6, 7, 8 and 9) are provided at the bottom of the housing 71 and are integral therewith. A cross pin 111 to be described later, is adapted to rest on the upper edges of the rails 77.

Pins 80 and 81 (Figs. 6, 8 and 9) are provided in housing 71 to pivot a bail 82 (Figs. 6, 7 and 11) which has a central finger 83 at its lower end and arms 84 and 84' (Fig. 6) at its upper end. One end of a tension spring 85 is secured to the arm 84' and the other end of this spring is connected to a pin 86 secured to the housing 71, thus urging the bail 82 in a clockwise direction. This bail 82 is limited in its clockwise movement by the end of slots 82' provided in rails 77. The arm 84 (Figs. 6, 7 and 11) carries a roller 88 on a pin 89 at its upper end, which roller cooperates with a cam arm 90 having a sleeve 91 journalled on a loosely mounted pin 92 that extends through a hole 93 provided in the lug 94 extending from housing 71. The sleeve 91 extends outwardly (Figs. 1 and 6) and the hub 95 of a lever arm 96 (Figs. 2 and 6) is attached to this sleeve. Rotatably mounted on the end of lever arm 96 is a roller 96*a* (Figs. 1 and 2) which engages or rides on and coacts with the control lever 38. The hub 97 of sleeve 91 which is integral with cam arm 90 projects into the notch 98 (Figs. 6, 7 and 8) at the upper portion of the housing 71 to keep this cam and lever assembly in place.

A frame 100 (Figs. 3, 4, 6 and 7) has end flanges 101 and side extensions 102 with flanges 103 (Fig. 6) thereon by means of which it is pivoted on the shaft 92. Pivots 105 that are threaded near their outer ends are screwed into threaded holes that extend through the flanges 101. A supporting member or carrier 108 (Figs. 3, 4 and 7) for the recorder-reproducer unit is pivoted on the pivots 105.

The pin or shaft 92 is provided with a collar 92*a* (Fig. 6) which coacts with one of the flanges 103 of frame 100 to limit longitudinal movement of said pin in one direction; and normally this pin is maintained in its proper position (as shown in Fig. 6) against appreciable lengthwise movement by the cover 70*a*, 71*a* of the housing 71. It will be apparent that if said cover 70*a*, 71*a* is removed from housing 71, the pin 92 can be disengaged from the sleeve 91 of cam arm 90, lug 94 of said housing and flanges 103 of frame 100, merely by sliding said pin to the left (Figs. 1 and 6); and thereupon the cam arm 90 and the parts carried thereby and attached thereto, and also the entire recorder-reproducer assembly comprising the frame 100, the carrier 108 and the recorder-reproducer unit itself, may be readily removed from the housing 71 for inspection, repair or other purpose. Also these parts can be quickly and easily assembled and replaced in their proper relative positions within the housing 71, as shown in Fig. 6.

An extension or enlarged portion 109 of the carrier 108 has a transverse opening 110 therethrough. A pin 111 extends across the opening 110 and a lever 112 is journalled on the pin 111 in opening 110. A projection 113 (Fig. 4) is provided at the lower end of the lever 112 and a notch 114 is provided at the upper end of this lever. A tension spring 115 extends from the notch 114 to a lug 116 on the carrier 108.

The recorder-reproducer unit has a body portion consisting of juxtaposed pieces of recessed insulating material 120 and 121 (Figs. 3, 4 and 7) hollowed out along the insides to provide a cavity when assembled to contain a type of a transducer which, as shown, is in the form of a conventional electric "bimorph" element 122 which is clamped at one end and at the middle between damping pads 123 and 124 in the well-known manner. The body portion pieces 120 and 121 are firmly secured together by two pairs of screws 130' and 140'. A rigid stylus holder 126 is securely attached to the free end of the transducing element 122 and has spaced arms

127 with an integral cross-piece 128 at the outer ends of these arms in which the recording stylus 129 is mounted. A nose piece 130 extends downwardly slightly at the end portion of the recorder-reproducer unit and is fastened by the screws 130' (Figs. 5, 7 and 10) to the body portion pieces 120, 121. An inwardly extending lip 131 provided on the nose-piece 130 serves as a stop for the reproducer stylus holder 133 (Figs. 3, 4, 5 and 7). The reproducer stylus holder 133 has side flanges 134 journalled on a cross-pin 135 that is supported in the nose piece 130. The holder 133 has a spring extension 136 of which the end is adapted to bear on the cross piece 128. A reproducer stylus 137 is mounted at the outer end of the stylus holder 133.

A screw 140 (Figs. 3–5) passes through the end of the body portion 121 of the recorder-reproducer unit and into a threaded hole in a metal hinge plate 141 that is provided with a slot 142 for the projection 113 on lever 112. A tension spring 144 has one end connected to a strap 145 which is held by the screw 140 and the other end of this spring is connected to the lug 116 on carrier 108. A friction damping spring strip 148 (Figs. 3, 4 and 7) is clamped by the screw 140 to the body piece 121. A fixed ball 149 is clamped in an opening in extension 109 of carrier 108 to be contacted by the free end portion of spring strip 148 when the device is in recording position as shown in Fig. 3.

The hinge plate 141 (Figs. 3, 5, 7 and 10) is provided with side arms or flanges 154 having holes near their ends by which the recorder-reproducer unit is pivoted on the conical ends 156 of pin 111 to the carrier 108. The screw 157 is for adjusting the tightness of this plate 141 on pin 111, which pin is tight in the side walls of opening 110.

Integral projections 150 (Figs. 3, 5 and 7) having bevelled ends and bevelled inner sides are provided along the bottom of the body piece 121.

A pin 151 (Fig. 3) is secured to a flexible shaft 151*a* which is located in a recess 74 in the front wall of the housing 71. Also secured to this shaft is a screw 151*b*. The pin 151 extends through a hole 75 in the lower part of said housing and is located so that it is adapted to be engaged by the hinge plate 141 at approximately the point designated 141' (Fig. 5), thus serving to limit the downward movement of the recorder-reproducer unit when the latter is in recording position, to prevent the stylus 129 from being broken by contact with the record carrier 7 when no record is mounted on the latter. Another pin 151' (Fig. 4) is secured to a flexible shaft 151*a*' which is located in a recess 74' in the wall of housing 71. Also secured to shaft 151*a*' is a screw 151*b*'. The pin 151' extends through a hole 75' in the bottom wall portion of said housing and is located so that it is adapted to be engaged by the flat lower surface 150' (Fig. 5) of one of the projections 150 of the body piece 121, thus serving as a limit stop to prevent the stylus 137 from being broken by the record carrier 7 when the recorder-reproducer unit is in reproducing position and no record is mounted on said carrier. Screws 151*b* and 151*b*' are for adjusting the positions of pins 151 and 151', respectively.

The frame 100 and the carrier 108 having the fixed pin 111 on which the recorder-reproducer unit is pivotally mounted by the hinge plate 141, are biased by gravity and also by a strong tension spring 89' anchored at its ends respectively to the housing 71 and a lug provided on said frame, about the pin or shaft 92 to the sharply tilted position shown in Figs. 3 and 7 with the end portions of pin 111 bearing on the spaced rails 77 of housing 71. The said frame and carrier will be in this sharply tilted position whenever the recorder-reproducer assembly is adjusted either to neutral or to recording condition; but when said assembly is properly adjusted for reproducing the frame 100 and carrier 108 will be in the slightly tilted position shown in Fig. 4.

The surface of cam arm 90 with which the roller 88 carried by the bail arm 84 cooperates, comprises two cam sections 90*a* and 90*b* and an intermediate section or dwell 90*c* which is concentric with the pivotal axis of the cam arm. Also the cam arm has a portion or heel 160 which is adapted to coact, as hereinafter described, with a lug 161 provided on the frame 100 in the adjustment of the recorder-reproducer assembly from neutral to reproducing position and from reproducing to neutral position.

The lead 78 (Figs. 6, 7 and 10) from one terminal of the piezoelectric transducer is connected to an insulated and shielded conductor, not shown, that is brought in through channel 78*a* (Figs. 6 and 8) from an amplifier of the usual sort that is used for amplifying the electrical impulses that are either transmitted to the transducer or received from it. The lead 79 extends from the other terminal of the crystal transducer to the frame 100 and is grounded to the latter as by soldering. Only portions of these leads are shown so as not to confuse the drawing. These leads are well shielded electrically since they are for the most part enclosed by the metal housing 71 and the metal cover housing 71*a*. Even the lower portions of these leads are shielded, where they pass through the opening 72 in the housing 71 for the recorder-reproducer assembly, by the metal plate 141 and its flanges 154.

The construction and arrangement are such that when the control lever 38 is in its intermediate neutral position (Fig. 2) it is releasably held in that position, through the medium of link 41 and barrel 45, by the engagement of the roller 49 carried by said barrel, with the notch 50' in the spring-biased detent lever 51 (Fig. 7); and the feed-nut lever 58 is then held, against the urge of spring 62, in the position shown in Fig. 2 with the feed nut 64 disengaged from feed screw 21, by the engagement of said roller 49 with a high portion of the cam 59' secured to said lever. The frame 100 and carrier 108 are then in the above described sharply tilted position with pin 111 pressed against the rail 77; and the control lever 38 through the medium of the freely pivoted cam and lever arm assembly 90—95*a*, holds the bail 82 against the urge of spring 85, in the pivotal position shown in Fig. 7 with its lower end spaced from the stop walls 32' of rails 77. The roller 88 on the bail then engages the cam arm 90 of said assembly at a point which is approximate the junction of the cam and dwell sections 90*a* and 90*c*. In this pivotal position of bail 82 the end of its finger 83 engages the body piece 121 of the recorder-reproducer unit at a point between the beveled projections 150 and thereby holds said unit raised about its pivot pin 111 to the inoperative position shown in Fig. 7, wherein it is substantially at right angles to the frame 100 and carrier 108, and also holds said unit centralized with respect to its range of lateral play or movement about the pivotal axis of the carrier 108 therefor. When the recorder-reproducer unit is in such raised

position the free end of the spring strip 148 bears lightly on the ball 149 secured to the carrier 108.

The operation is as follows:

If the apparatus is adjusted to neutral with the recorder-reproducer unit and the associated parts in the positions just described, and the user wishes to record, he places a record cylinder 8 upon mandrel 7, starts the motor, moves the carriage 35 along rods 25 and 26 to proper position, and presses the control lever 38 (Fig. 2) downwardly about the pivot pin 39 to its lowermost or recording position; and he then engages the clutch 15—16 in the usual way to drive shaft 10 and proceeds to dictate. The movement of lever 38 to its lowermost position causes link 41 and pin 42 (Fig. 2 and right-hand portion of Fig. 7) to turn the barrel 45 counterclockwise to the position shown in the right-hand portion of Fig. 3 where it is releasably held by the engagement of the roller 49 carried by said barrel with the notch 50 of the spring-biased detent lever 51 to thereby likewise hold lever 38 in said lowermost position. This movement of control lever 38 also causes the roller 49 to ride over and to a lower point of the cam 59' of feed nut lever 58, thus permitting the latter to turn clockwise on shaft 55 under the action of spring 62 and bring the feed nut 64 into engagement with feed screw 21. Engagement of the clutch numbers 15, 16, will then cause the carriage 35 to be moved along rods 25 and 26 at the proper rate for the cutting of a record groove in the cylinder 8 by the stylus 129. The adjustment of lever 38 from neutral to recording position also results in clockwise movement of the bail 82 under the action of spring 85, to the position shown in Fig. 3 where it engages the stop walls 82' of rails 77. As the bail 82 moves to this position the roller 88 carried thereby rides onto and along the cam section 90*a* of arm 90 and the cam and lever arm assembly 90—96*a* under the action of gravity and the spring 85, is turned counterclockwise, with the lever arm 95 following control lever 38 in its downward movement, until the cam arm 90 reaches the position shown in Fig. 11 where the roller 88 engages the lowest point of the cam section 90*a*. The recorder-reproducer unit under the action of gravity, follows the bail 82 during part of the latter's movement to the position shown in Fig. 3 and swings downwardly about pivot pin 111 until the recording stylus 129 is brought into engagement with the record cylinder. The finger 83 of bail 82 remains in contact with the body piece 121 of the recorder-reproducer unit at a point between the projections 150 throughout such downward movement of said unit, and accordingly the stylus 129 is engaged with the cylinder 8 in proper centralized position. The recorder-reproducer unit when in this recording position, is in an obtuse angular relation to the frame 100 and carrier 108 (see Fig. 3); also the stylus 129 engages the record cylinder 8 under a comparatively light pressure because the spring 115 attached to lever 112 is then in a collapsed condition, the projection 113 of this lever is in spaced relation to the edges of the slot or opening 142 in hinge plate 141 and the spring 144 is distended and acts to offset or counterbalance to a marked degree the weight of the recorder-reproducer unit and therefore the effective force with which the stylus 129 engages the cylinder. It is further apparent that when the recorder-reproducer assembly has thus been adjusted for recording, the pivot pin or shaft 111 remains engaged with the rails 77 under considerably pressure, whereby under normal operating conditions the carrier 108 and the recorder-reproducer unit are effectively held from lateral or side-wise movement about the pivotal axis of said carrier. Also in this adjustment of the recorder-reproducer assembly the spring arm 148 engages the ball 149 with a considerable pressure and acts as a damping means during recording to prevent unwanted high frequency vibrations being set up in the transducer mounting.

If it is now desired to restore the recorder-reproducer assembly to neutral condition in order to backspace the carriage 35, or to remove or replace the record cylinder, or for any other purpose, control lever 38 is merely moved from its lowermost recording position to its intermediate neutral position (Fig. 2), whereupon the recorder-reproducer unit and associated parts are returned to the positions shown in Figs. 2 and 7. In this movement of the control lever the following things take place: The control lever by means of link 41 and pin 42, moves the barrel 45 clockwise causing the roller 49 on pin 48 to ride over the cam lever 51 from the notch 50 and into the notch 50' (Fig. 2), and also causing said roller to ride over the cam 59' of feed nut lever 58 from the low cut away portion 59*b* of said cam to the adjacent high portion thereof whereby said lever 58 is turned counter-clockwise to disengage the feed nut 64 from feed screw 21. At the same time lever 38 turns the cam and lever arm assembly 90—96*a* clockwise about shaft 92 whereupon the arm 90 of this assembly moves bail 82 counter-clockwise about the pins 80, 81 against the action of spring 85. In this movement of bail 82 roller 88 rides over the cam section 90*a* of arm 90 and onto the adjacent dwell 90*c*, and the finger 83 engages and raises the recorder-reproducer unit about pin 111 out of operative relation to the record cylinder 8 and it also centralizes said unit (if not already centralized) by coacting with one of the opposed inclined surfaces of the projections 150.

If with the recorder-reproducer assembly and associated parts in neutral, it is desired to condition the same for reproducing, the control lever 38 is moved upwardly from the position shown in Fig. 2 to its highest or reproducing position. In this movement lever 38 turns barrel 45 clockwise thereby causing the roller 49 to ride over detent lever 51 from the notch 50' onto the beveled end 52 (see Fig. 4) and also causing said roller to ride over the cam 59' of feed nut lever 58 from the high point of said cam (see Fig. 2) and onto the adjacent inclined end portion thereof. Thereupon the spring 62 turns lever 78 clockwise on shaft 55 so as to bring the feed nut 64 into engagement with feed screw 21. In its upward movement to reproducing position lever 38 also turns the cam and lever arm assembly 90—96*a* clockwise about shaft 92 from the position thereof shown in Figs. 2 and 7, whereupon the heel 160 of cam arm 90 is brought into engagement with the lug 161 on frame 100 and thereby said frame and the carrier 108 are turned clockwise about shaft 92 to the slightly inclined position shown in Fig. 4. In this clockwise movement of frame 100 and carrier 108, the pivot pin 111 on which the recorder-reproducer unit is mounted is raised from engagement with the rails 77 and said unit is carried upwardly and leftwardly to a point where the reproducer stylus 137 is in opposed operative relation to the record cylinder 8. During the major portion of these clockwise movements of the cam and lever arm

assembly 90—96a and of frame 100 and carrier 108, the roller 88 on bail 82 rides over the dwell 90c of cam arm 90 and said bail is accordingly maintained substantially in the position shown in Fig. 7 with the bottom thereof spaced from the stop walls 82' and with the finger 83 engaged with the body piece 121 of the recorder-reproducer unit between the projections 150 thereof to thereby maintain said unit in raised inoperative position with respect to the record cylinder 8, but at the same time said recorder-reproducer unit is caused to move counter-clockwise about pin 111 with respect to frame 100 and carrier 108 to a relatively acute angular position. In this counter-clockwise movement of the recorder-reproducer unit with respect to the carrier 108 the spring strip 148 is raised from engagement with ball 149, the spring 144 is collapsed and the edge of the slot or opening 142 in hinge plate 141 is engaged with the projection 113 of lever 112 so as to move said lever counter-clockwise and thereby extend the spring tension 115 (see Fig. 4). In the latter minor portion of the clockwise movement of cam arm 90 effected by the movement of lever 38 to its uppermost position, the roller 88 rides from dwell 90c of said arm onto the abrupt cam section 90b whereupon spring 85 moves bail 82 clockwise into engagement with stop walls 82' and the finger 83 out of engagement with the recorder-reproducer unit. Under the actions of gravity and spring 115, said unit then moves downwardly about pin 111 the slight distance required to bring the reproducing stylus 137 into contact with the record cylinder 8. As the finger 83 is not disengaged from the recorder-reproducer unit until just before the stylus 137 contacts the cylinder 8, it assured that said unit will reach its operative position when centralized in respect of its lateral play. The recorder-reproducer unit and associated parts will now be in the positions shown in Fig. 4. It is apparent that gravity and spring 115 will then maintain the stylus 137 in engagement with cylinder 8 under a relatively high pressure and also that the recorder-reproducer unit and therefore said stylus 137 may readily be moved, to a limited extent, in either direction about the pivotal axis of the carrier 108. Therefore during reproducing the stylus 137 will be effectively engaged with and faithfully follow the sound record groove. Also as the pivoted holder 133 for the stylus 137 engages and coacts with the rigid element 126 through the spring arm 136 thereof the danger of breaking said stylus is greatly minimized.

In case it is desired to adjust the recorder-reproducer assembly and associated parts from reproducing to neutral condition, the control lever 39 is moved downwardly to its intermediate or neutral position (Fig. 2) whereupon said assembly and parts are brought to the positions shown in Figs. 2 and 7 and hereinbefore described. In this movement of lever 38 the following things take place: The lever 38 through its link and pin connection 41, 42 with the barrel 45, turns the latter counter-clockwise from the position shown in Fig. 4 to that shown in Fig. 7. This causes roller 49 to ride over the detent lever 51 from the bevelled end 52 thereof to the notch 50' and also causes said roller to ride over the cam 59' of feed nut lever 58 along the inclined end portion and onto the adjacent high portion thereof and thereby effects contra-clockwise movement of lever 58 to raise the feed nut 64 from engagement with the feed screw 21 (see Fig. 2). Concurrently and under the action of gravity

and of tension spring 89', the structure comprising the frame 100, carrier 108 and the recorder-reproducer unit supported on the latter are moved contra-clockwise until the pivot pin 111 is brought into engagement with rails 77; and the cam and lever arm assembly 90—96a is likewise turned contra-clockwise about shaft 92 and follows the movement of the control lever by reason of the engagement of roller 96a with said lever, until the cam arm 90 reaches the position shown in Fig. 7. In such contra-clockwise movement of the cam and lever arm assembly 90—96a, the roller 88 on bail 82 rides over the cam arm 90 from the abrupt cam section 90b onto the dwell 90c. Cam section 90b then coacts with said roller to turn the bail counter-clockwise against the action of the relatively weak spring 85 and thereby causes the finger 83 of said bail to engage the body piece 121 of the recorder-reproducer unit at some point within the space defined by the opposed inclined sides of the projections 150 to thereby raise said unit about pin 111 to inoperative position with both of the styli 129 and 137 out of engagement with cylinder 8 and at the same time to centralize said unit in respect of its normal lateral play when in reproducing position.

What is claimed is:

1. In a phonographic translating device adapted for coaction with a record and including a support means: the combination of a translating unit connected to said support means for universal movement relative to the record, means for conditioning said unit for recording and reproducing respectively, means comprising relatively movable elements carried with said support means and said unit respectively and in frictional association with each other for frictionally damping movements of the unit in directions towards and away from the record, and means operable by said conditioning means for effectively associating said damping means with said unit only when the unit is conditioned for recording.

2. In a phonographic translating device adapted for coaction with a record: the combination of a support means, a translating unit pivoted to said support means on an axis substantially parallel to the record for movement towards and away from the record, and means for damping pivotal movement of said unit comprising a flat spring element and a ball element in slidable frictional engagement with the spring element, one of said elements being carried by said unit and the other being carried by said support means.

3. The combination set forth in claim 2 wherein the contacting surface of said spring element is substantially normal to the plane through said pivot axis and through the point of contact between said spring and ball elements.

4. In a phonographic translating device adapted for selectively recording on and reproducing from a moving record: the combination of a translating unit having recording and reproducing styli and biased towards the record, a frame, support means pivoted to said frame, means pivotally connecting said unit to said support means for universal movement relative to the record, means for pivoting said support means to move said styli selectively into engagement with the record, means effective on said unit for counteracting partially the bias of said unit against the record, means for augmenting the bias of the unit towards the record comprising a lever pivoted to said support means and operable against said unit, and spring means operatively connected between said support means

and said lever for urging the lever against said unit; and stop means on said support means moved against said lever for disengaging the lever from said unit to disable said bias-augmenting means as said support means is pivoted to place said recorder stylus into contact with the record.

5. The combination set forth in claim 4 wherein said bias-counteracting means comprises a tension spring connected between points on said unit and support means which are moved towards each other to reduce the counteracting effect of said spring as said device is conditioned for reproducing.

6. In a phonographic translating device adapted for coaction with a moving record: the combination of a frame, a translating unit pivotally supported on said frame in a downwardly-inclined direction for engagement with a mounted record, a stop screw-threaded in a lower part of said frame in directions substantially parallel to the adjacent surface of a mounted record for engaging the under side of said translating unit to limit its movement towards the record, rotatably mounted means at the top of said device, and a flexible shaft connected between said stop and said rotatably-mounted means for adjusting the former by the latter.

7. In a phonographic translating device adapted for coaction with a moving record: the combination of a frame, a translating unit movably mounted on said frame and including recording and reproducing styli, said unit being urged towards the record, means for shifting said unit relative to said frame to place said styli selectively into engagement with the record whereby to operatively condition said device selectively for recording and reproducing, said unit having a flat under surface provided with a depending

projection, said projection having a dimension in the direction of shifting movement of the unit less than the distance of said shifting movement, and adjustable stops in said frame one of which is positioned to engage said flat under surface to limit the downward movement of said unit when in one of its operative conditions and the other of which is positioned to engage said projection to limit the downward movement of said unit when the unit is in the other of its operative conditions.

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