

March 8, 1949.

G. P. BRUBAKER

2,463,513

SOUND RECORDER

Filed June 28, 1943

5 Sheets-Sheet 1

Fig. 1

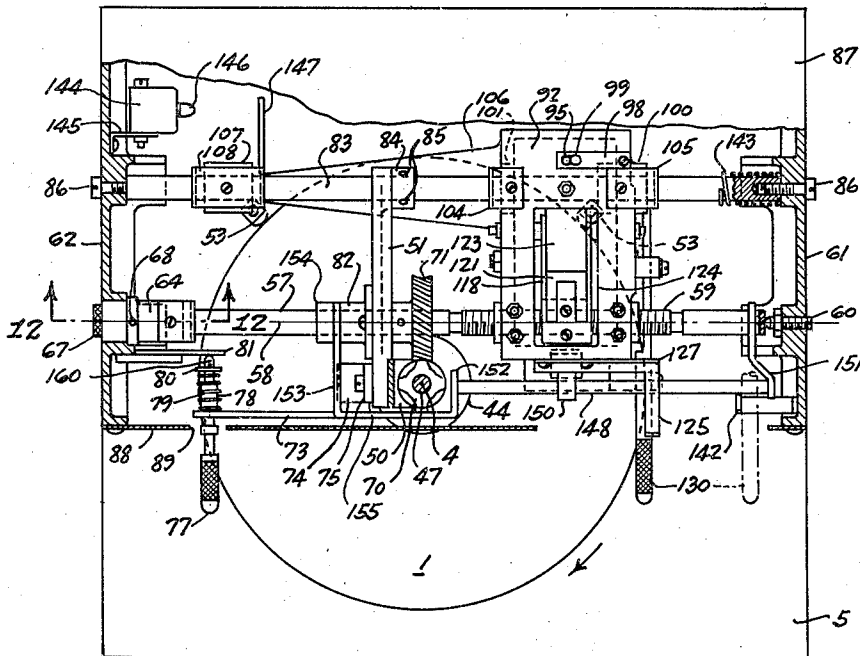
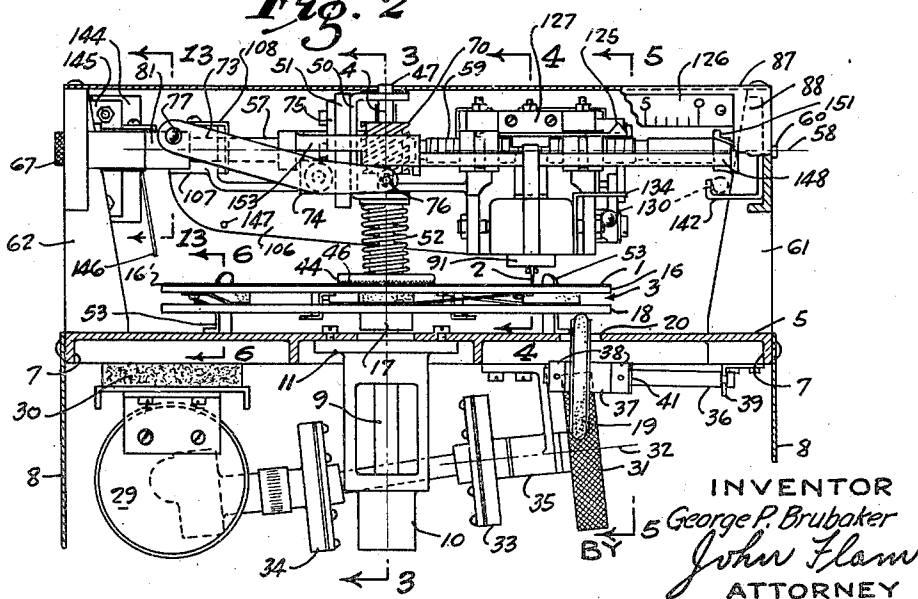


Fig. 2



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5 Sheets-Sheet 2

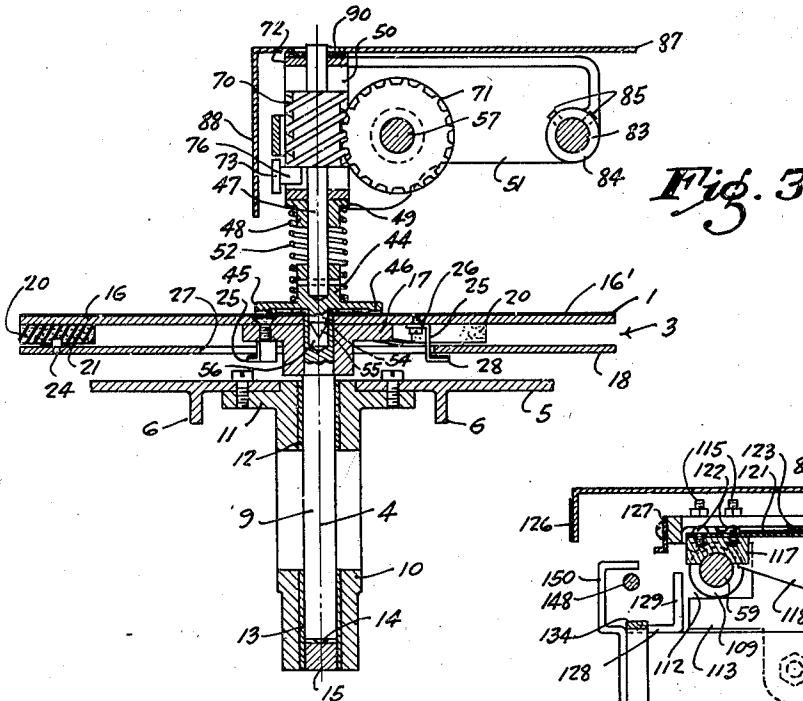


Fig. 3

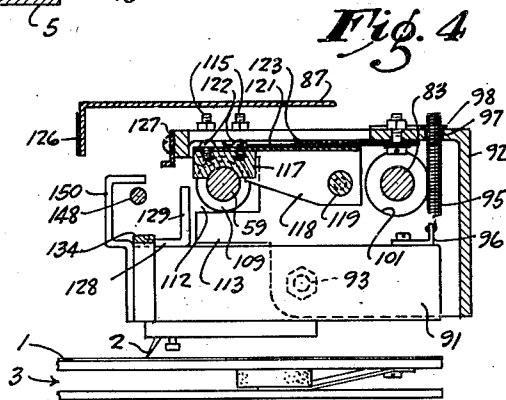


Fig. 4

Fig. 5

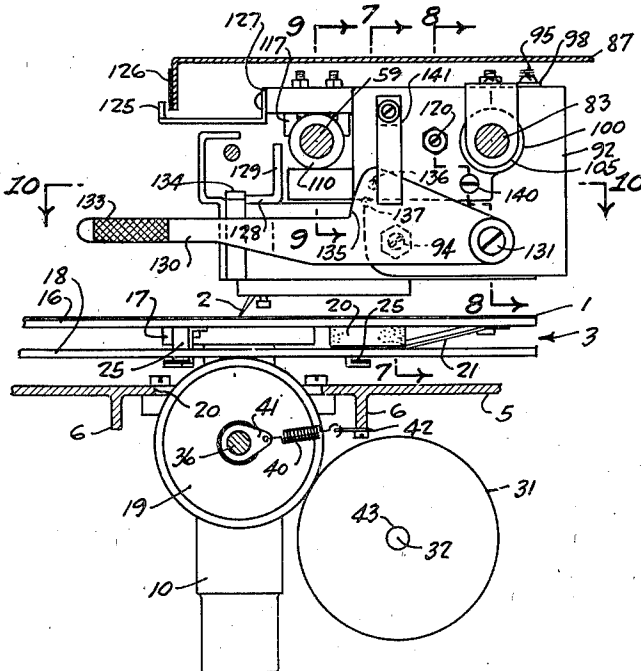
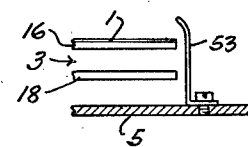


Fig. 6



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SOUND RECORDER

Filed June 28, 1943

5 Sheets-Sheet 3

Fig. 7

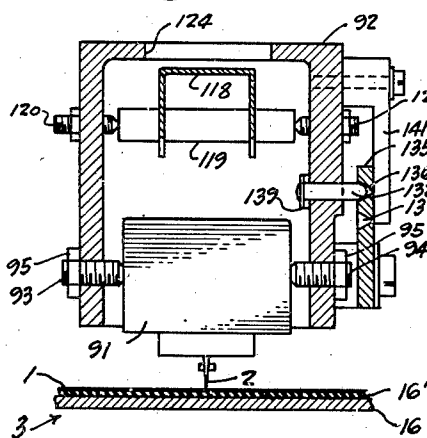


Fig. 8

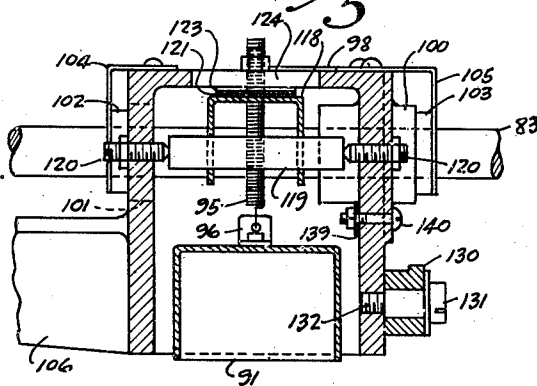


Fig. 12

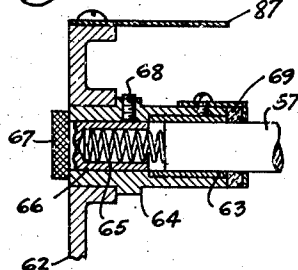


Fig. 11

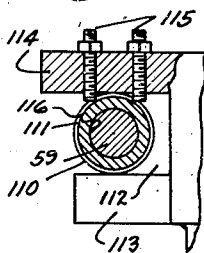


Fig. 9

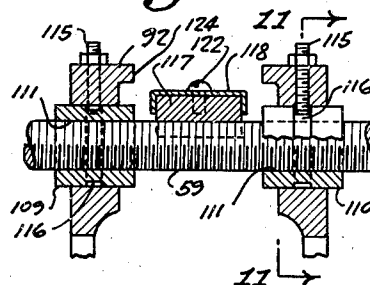


Fig. 10

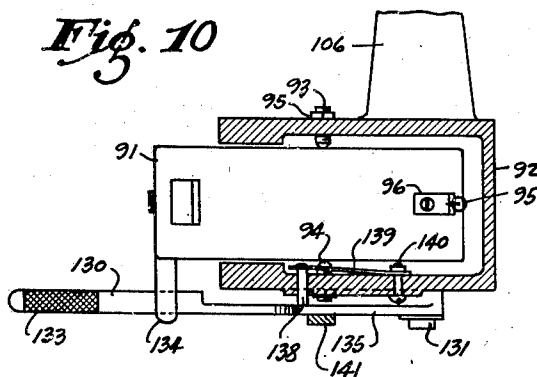
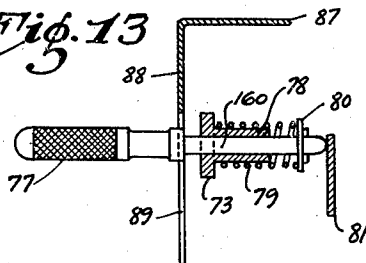


Fig. 13



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2,463,513

SOUND RECORDER

Filed June 28, 1943

5 Sheets-Sheet 4

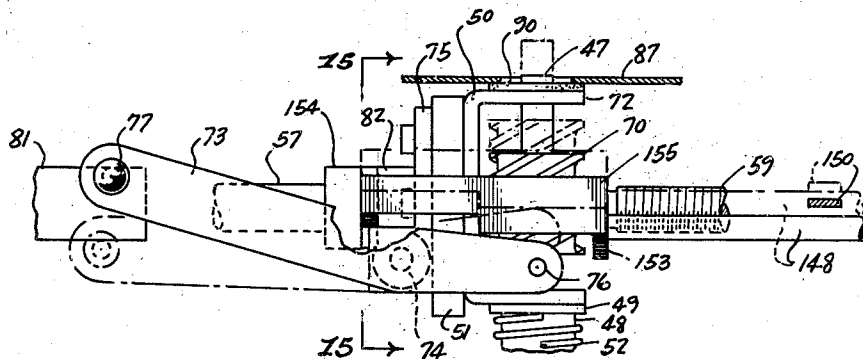


Fig. 14

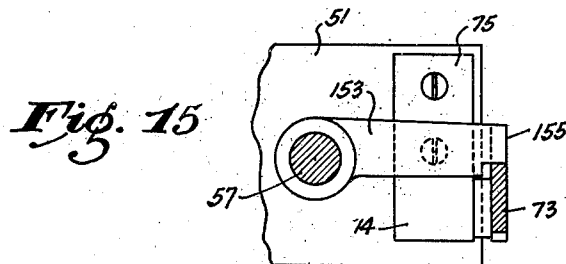


Fig. 15

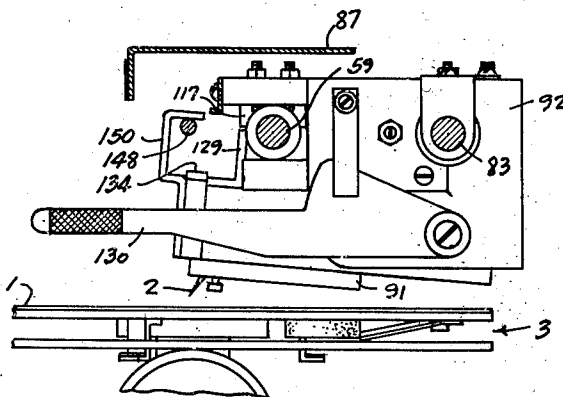


Fig. 16

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2,463,513

SOUND RECORDER

Filed June 28, 1943

5 Sheets-Sheet 5

Fig. 18

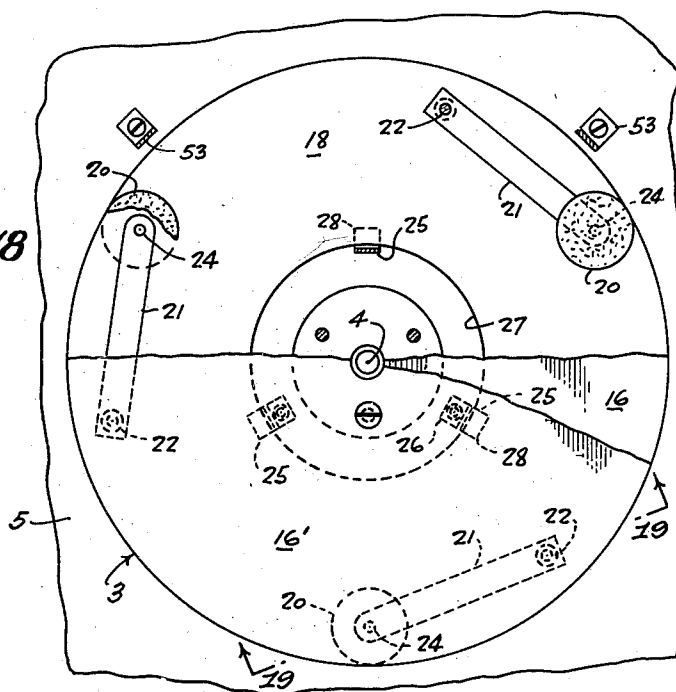


Fig. 19

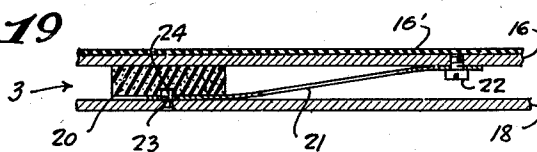
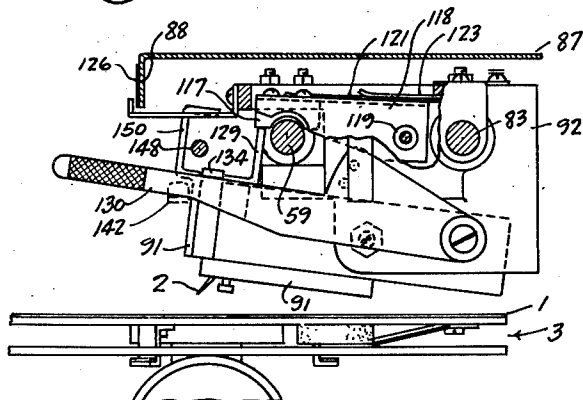


Fig. 17



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UNITED STATES PATENT OFFICE

2,463,513

SOUND RECORDER

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by mesne assignments, to Dictaphone Corpora-
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York

Application June 28, 1943, Serial No. 492,538

10 Claims. (Cl. 274—13)

1

This invention relates to sound apparatus, and particularly to apparatus utilizing a stylus for recording sound on a record blank.

This type of recorder is now well known. It may take any of several forms; for example, it may utilize, as a record blank, either a cylindrical member or a disc, or a strip of flexible material. As the record blank is moved past the stylus, the stylus head is caused to move laterally to the movement of the blank. Usually this lateral movement is effected by a lead screw operated by the source of motion that moves the blank.

It is one of the objects of this invention to improve, in general, apparatus of this character.

It is another object of this invention to provide a novel mechanism for controlling the movement of the stylus head, including a mutilated nut that can be coupled or uncoupled at will, and in response to the lifting or lowering of the stylus with respect to the record.

It is still another object of this invention to make it possible effectively to use record blanks that are quite thin on a rotating table, without danger of relative movement between the table and the record. This object is accomplished by utilizing a resilient force clamping the center portion of the disc blank to the table.

It is still another object of this invention to facilitate the placing of the record blank in operative and centralized position on the table.

It is still another object of this invention to ensure that the table will be started and stopped without abruptness, thus preventing intolerable irregularities in angular motion of the record blank.

This invention possesses many other advantages, and has other objects which may be made more easily apparent from a consideration of one embodiment of the invention. For this purpose there is shown a form in the drawings accompanying and forming part of the present specification. The form will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of this invention is best defined by the appended claims.

Referring to the drawings:

Figure 1 is a plan view, partly in section, of a recorder incorporating the invention;

Fig. 2 is a front elevation, partly in section, of the apparatus illustrated in Fig. 1;

Figs. 3, 4, 5, and 6 are sectional views, taken

2

respectively along the correspondingly numbered planes of Fig. 2;

Figs. 7, 8, 9, and 10 are sectional views, taken along correspondingly numbered planes of Fig. 5;

Fig. 11 is a fragmentary sectional view, taken along plane 11—11 of Fig. 9;

Fig. 12 is a fragmentary sectional view, taken along plane 12—12 of Fig. 1;

Fig. 13 is a fragmentary sectional view, taken along plane 13—13 of Fig. 2;

Fig. 14 is an enlarged fragmentary front elevation, illustrating the manner in which one of the controlling levers may be operated for rendering the lead screw feed inactive;

Fig. 15 is a sectional view, taken along plane 15—15 of Fig. 14;

Fig. 16 is a fragmentary view, similar to Fig. 5, but illustrating the stylus head lifted from the record;

Fig. 17 is a view similar to Figs. 5 and 16, but illustrating another position of the stylus head in which the stylus is lifted from the record and the lead screw feed nut is uncoupled from the lead screw;

Fig. 18 is a fragmentary top plan view of the turntable, parts of the turntable being broken away; and

Fig. 19 is a sectional view taken along 19—19 of Fig. 18.

The record is intended to be made upon a thin record blank 1 of disc form (Figs. 1, 2, and 3). This record blank may be made from any desirable form of plastic material capable of being impressed by a recording stylus 2 (Figs. 2 and 5). The record blank 1 is supported upon a turntable structure 3 (Figs. 2, 3, and 4). This turntable structure, as will be explained hereinafter, is driven about an axis 4 (Figs. 2 and 3), so as to advance the record blank 1 with respect to the stylus 2. Simultaneously, the stylus 2 is caused to move transversely across the face of the record blank 1 to produce a spiral groove record in a well understood manner.

The manner in which the turntable structure 3 is driven, and serves to support the record blank 1, may now be described.

A stationary frame 5 (Figs. 1, 2, 3, and 5) serves as the main support for substantially all of the operating parts of the apparatus. This frame 5 may be a casting appropriately ribbed for strength, as indicated, for example, at 6 (Figs. 3 and 5). Around the edge of frame 5, a flange 7 is provided (Fig. 2). To this flange may be appropriately secured sheet metal cover mem-

bers 8, forming a box-like structure below the top of frame 5. This box-like structure may be appropriately reinforced at the corners and may be provided with appropriate feet (not shown).

The turntable structure 3 is supported rotatably on frame 5. For this purpose it is provided with a spindle 9 that is journaled for rotation in a standard 10 (Figs. 2, 3, and 5). This spindle 9 serves to constrain the motion of the turntable structure 3 angularly about the axis 4. The standard 10 is shown, in this instance, as fastened to the lower surface of the frame 5, as by the aid of a flange 11, integral with the standard 10. Furthermore, the standard 10 has a pair of spaced bearing bushings 12 and 13 (Fig. 3) in which the spindle 9 is journaled. The lower end of the spindle 9 is shown as supported upon a thrust bearing including a ball 14 resting upon the plug 15 which is disposed in the bottom of the standard 10.

The record blank 1 is disposed upon the upper table member 16, the upper surface of which is provided with a resilient non-slip facing 16' formed of a thin layer of rubber or other appropriate material secured to member 16 as by a suitable adhesive. This table member is attached to a hub 17 that is securely fastened to the upper part of the spindle 9. The lower member 18 is axially spaced from the upright table member 16. The drive for the turntable is provided by frictionally engaging and driving the lower surface of member 18, as by a rubber covered roller 19 (Figs. 2 and 16). The manner in which the roller 19 is driven will be described hereinafter. It is sufficient, for the present, to note that this roller 19 extends through an appropriate opening or slot 20 in the frame 5, as shown most clearly in Figs. 2 and 5, to engage the member 18.

The rotation thus imparted to the member 18 is transmitted to the upper table member 16 through a resilient connection. In this way, a cushioned drive for the record blank 1 is secured, harmfully abrupt changes in angular velocity being thus avoided, even in the process of starting and stopping the turntable structure 3. This resilient connection is illustrated most clearly in Figs. 3, 18, and 19. It includes the sponge rubber pads 20, three of which pads are shown in the present instance. These sponge rubber pads are attached at their upper faces to the lower surface of the table member 16, as by an appropriate adhesive. Each pad, furthermore, is fastened to the free end of a corresponding spring finger 21. The other end of the spring finger 21 is attached as by a screw 22 to the lower surface of the table member 16.

In order to couple the drive member 18 to the sponge rubber pad structure, each of the fingers 21 is provided with an aperture 23 adapted to accommodate pin 24 that is fastened to the lower drive member 18.

Thus, to assemble the table structure 3, the lower member 18 is first placed in proper relative angular position with respect to the table member 16, bringing the pins 24 into alignment with the apertures 23, and then the parts 16 and 18 are moved toward each other to telescope the pins into the apertures.

In order to prevent total separation of the parts 16 and 18, after thus assembling them, use is made of a number of stop members 25 (Figs. 3, 17, and 18). Each of these stop members has a horizontal portion 26 attached to the lower face of the table member 16. Each stop member

25 projects through the central aperture 27 of the drive member 18 and has a horizontal stopping extension 28 projecting beneath the edge of the aperture 27.

The roller 19 is driven from a motor 29 (Fig. 2). This motor is shown as appropriately supported on the lower side of frame 5, as by the aid of a resilient mounting 30. Through appropriate reduction gearing, the motor 29 drives a roller 31. This roller 31 has a periphery that is knurled and in frictional engagement with the roller 19.

The driving shaft 43 (Fig. 5) for the roller 31 is shown as having an axis 32 (Fig. 2) inclined with the horizontal and is shown as joined to the output shaft of motor 29 through a pair of flexible coupling structures 33 and 34. The bearing bracket 35, carried by the frame 5, serves as a support for the right hand end of the driving shaft 43.

The driving roller 19 is so mounted that it may be urged resiliently into contact with both the power roller 31 and the lower drive member 18 of the table structure 3. For this purpose, it is shown as freely rotatable on a non-rotary shaft 36. The roller 19 is provided with a hub 37 confined against axial movement by the collars 38, spaced along shaft 36. The right hand end of the shaft 36 is shown as accommodated loosely in a slot in bracket 39 fastened to the frame 5.

The roller 19 is urged into engaging position by the aid of the spring 40 (Fig. 5). One end of the spring is anchored to an anchor plate 41 carried by one of the collars 38. The other end of the spring is anchored to a similar anchor plate 42 fastened to one of the ribs on the frame 5.

Since the rubber periphery of roller 19 is convex, exact parallelism of the shaft 36 with the lower surface of drive member 18 is not essential; and the spring 40 can move the shaft 36 into a position where the rubber periphery of roller 19 is in proper driving relation with the power roller 31 and the drive member 18.

Provisions are made for ensuring that the record blank 1 will be effectively clamped to the table member 16. For this purpose a coupling member 44 (Figs. 1, 2, and 3) may be used. This coupling member has a coupling flange 45, the lower surface of which is provided with serrations or teeth 46 urged against the blank 1. This coupling member 44 is shown as joined to the lower end of a rod 47. This rod 47 is guided for axial movement in a sleeve 48. This sleeve 48 is shown as having a flange 49 contacting the lower side of a stationary bracket 50. This bracket is supported on a stationary support 51. The manner in which this stationary support is mounted will be hereinafter described.

The coupling flange 45 is urged resiliently against the record blank 1 by a compression spring 52 that is disposed around rod 47, and that has its upper end in contact with the flange 49 of sleeve 48. The force exerted by the coupling flange 45 urges the record 1 against the resilient facing 16' on turntable 3, thereby preventing slippage of the record on the turntable. Further, the serrations on the coupling member ensure against slippage between the coupling member 45 and the record 1. Thus, when the coupling member is in record holding position, the coupling member and the record are caused to rotate uniformly with the turntable 3.

The centering of the record blank 1 on the table structure 3 is accomplished expeditiously in

5

a manner now to be described. In this connection, attention is particularly invited to Figs. 1, 2, 3, and 6.

Mounted on the frame are a pair of abutments or stops 53. These stops are quite closely spaced from the edge of the upper table member 16. They are angularly spaced about the axis 4 of the turntable and in such manner that the record disc 1 can be slid over the upper table member 16 and the blank will be stopped by the abutments 53 in a position approximating central of the turntable structure. This movement of the record disc 1 is accomplished while the coupling member 45 is elevated against the pressure of spring 52 in a manner to be hereinafter described.

The act of lowering the coupling member 45 serves more accurately to position the record blank 1. For this purpose the record blank 1 is centrally apertured to correspond with the diameter of a downwardly extending projection 54 (Fig. 3) carried by the coupling flange 45. This projection 54 terminates in a taper 55 and is accommodated in a recess 56 in the upper part of the spindle 9. Accordingly, as the coupling member 45 moves downwardly, the tapered portion 55 co-operates with the edge of the aperture in blank 1 to bring the blank 1 into substantially exact register with the table member 16.

Rotation of the turntable structure 3 by roller 19 also causes rotation of a lead screw structure for moving the stylus 2 in a general radial direction with respect to the record blank 1.

For this purpose a lead screw shaft 57 (Figs. 1, 2, and 3) is arranged with its axis 58 parallel to the upper surface of the table structure 3. The lead screw shaft has a threaded portion 59 arranged to co-operate with a nut structure, as hereinafter explained, for moving a support for the stylus 2.

The shaft 57 is mounted for rotation at its right hand end by the aid of the pivot screw 60 (Fig. 1) which is threaded into a boss formed on a standard or bracket 61. This bracket 61 is shown as formed integrally with the frame 5.

At the opposite end, the shaft 57 is supported by the aid of a bracket 62, similar to bracket 61. In Fig. 12 the shaft 57 is shown as extending into a bearing bushing 63 disposed in a bearing support 64. This bearing support 64 encloses a compression spring 65 that urges the shaft 57 resiliently against the pivot screw 60. The spring 65, in this instance, is shown as accommodated within a sleeve 66 having a knurled head 67 and telescoping into the left hand side of the support 64. A set screw 68 holds the sleeve 66 in position in the support 64. Removal of set screw 68 permits removal of sleeve 66, and thereafter the shaft 57 may be easily removed through the support 64.

A dust excluding felt washer 69, surrounding shaft 57, may also be supported on the member 64 adjacent the right hand end thereof.

Rotation of the lead screw 59 is derived from the rotation of the turntable structure 3 by the provision of a worm 70 fastened to the rod 47 (Figs. 2, 3 and 14.) This worm 70 is shown as having steep multiple threads co-operating with the worm wheel 71 fastened to the shaft 57.

As the rod 47 is lifted to free the coupling member 45 from the record blank 1, the worm 70 is also lifted, as indicated in dotted lines in Fig. 14. The wheel 71 does not interfere with this movement of the worm, since the worm threads have a steep pitch.

6

A limit is placed upon the upward movement of worm 70 by the upper horizontal arm 72 of bracket 50. The rod 47 extends through this upper arm 72 for additionally guiding the rod for axial movement.

The mechanism for elevating the coupling flange 45 is best described in connection with Figs. 1, 2, 3, 13, 14, and 15. Thus, a lifting lever 73 is provided which is pivoted at an intermediate point in a bearing support 74.

This bearing support 74 is provided with an upwardly extending bracket 75 by the aid of which it is fastened to the left hand side of the supporting arm 51. The lever 73 may be provided with a pin journaled in the bearing support 74 and restrained in any appropriate manner against removal in an axial direction. The right hand end of the lever 73 carries a lifting pin 76 (see particularly Fig. 3) that extends below the lower edge of the worm 70.

Counter-clockwise rotation of lever 73, as viewed in Fig. 2, causes engagement of the pin 76 with the lower edge of worm 70 and a consequent raising of the rod 47. This, in turn, causes the spring 52 to be compressed, and the coupling member 45 is raised enough to release the record blank 1. Manipulation of lever 73 is facilitated by the provision of a finger grip 77. The raised position, corresponding to release of the record blank 1, may be indefinitely maintained by an appropriate lock mechanism; for example, as shown most clearly in Figs. 1, 2, and 13, the finger grip 77 is provided with a shank 160 axially slidable in a boss 78 formed integrally with the lever 73. This finger grip 77 is urged toward the right, as viewed in Fig. 13, by a compression spring 79 acting against a washer 80 carried on the shank 160. In the path of axial movement of this shank, there is a stationary plate 81 appropriately supported on the bracket 62. In the position in which the coupling member 45 is in operative relation to the record blank 1, the finger grip 77 extends slightly below the top edge of the plate 81. As, however, the lever 73 is moved to the dotted line position of Fig. 14, raising the worm 70, the shank 160 is urged below the lower edge of plate 81 and serves as an abutment against return of the lever 73 to the full line position of Fig. 14. Optionally, however, the finger piece 77 may be pulled outwardly to free shank 160 from the lower edge of plate 81; and, in this way, the operator is permitted to return lever 73 to the full line position of Fig. 14.

The shaft 57 which carries the lead screw 59 may be conveniently used for supporting the arm 51. For this purpose the arm 51 carries a sleeve-like member 82 (Figs. 1 and 14) through which the shaft 57 extends. The right hand end of the arm 51, as viewed in Fig. 3, is attached to a guiding rod 83 that has an axis parallel with the shaft 57 and that is fixed against rotation in a manner to be described. In order to fix the arm 51 to rod 83, it is provided with a boss 84 (Figs. 1 and 3) through which pass radially extending set screws 85. The ends of the guiding rod 83 are attached respectively to the brackets 61 and 62, as by the aid of screws 86 threaded into the apertures in the ends of this rod.

The brackets 61 and 62 also form a support for sheet metal cover 87, shown to best advantage in Figs. 2, 3, 4, 5, and 12. This sheet metal cover extends over the top of the bracket 50, as shown most clearly in Fig. 3, and has a front downwardly extending edge 88, immediately in front of the lever 73. As shown most clearly in Figs. 1 and 13, this front portion 88 may be slotted, as of 89, for

the passage of the finger grip 77 for manipulating the lever 73. Furthermore, as shown most clearly in Figs. 3 and 14, a felt dust washer 90 may be interposed between the top of bracket 50 and the cover 87. This cover is apertured for the passage of rod 47 (Fig. 14) when the coupling flange 45 is raised.

The stylus 2 is shown as projecting from a stylus head 91. This stylus head encloses the usual electric elements affected by electrical impulses for vibrating the stylus 2 in accordance with the sound impulses to be recorded. Since such apparatus is well known, further description of the head 91 is unnecessary.

The head 91 is supported for pivotal motion on a horizontal axis in a frame 92 (Figs. 1, 4, 5, 7, 8, and 10). This frame 92 is of general U-shaped configuration, the legs of which serve to support the pivot screws 93 and 94 (Fig. 7) for the head 91. These pivot screws may be locked in adjustment by the aid of the lock nuts 95.

The stylus head 91 is urged in a counter-clockwise direction, as viewed in Fig. 4, to provide a recording pressure on the blank 1. This recording pressure may be obtained by the aid of a tension spring 95. The lower end of this tension spring 95 is attached to a spring anchor 96 fastened to the rear upper edge of the head 91. The upper end of spring 95 is shown as projecting through an aperture 97 in the top of frame 92. It is anchored by the aid of a plate 98 carried by the frame 92. This plate 98 has a keyhole slot 99 (Fig. 1) therein. The spring 95 can pass through the large portion of the slot. After the spring tension has been adjusted by a pull exerted on the upper end of the spring to provide the desired stylus pressure, the spring may be moved into the narrow portion of the keyhole slot, and the spring is thereby anchored in the plate 92.

The lead screw 59 is arranged to cause a traversing movement of the frame 92, and a corresponding movement of stylus 2. For this purpose, the frame 92 is slidably guided on the guide rod 83. Thus, as shown most clearly in Fig. 8, the frame 92 is provided with a boss 100 at its right hand end, through which the guide rod 83 passes; and at its left hand end the frame 92 is provided with the clearance aperture 101. In order to exclude dust, felt washers 102, 103 may be held against the left and right hand edges respectively of the frame 92, as by the aid of the brackets 104, 105. In order to ensure against cocking action of the frame 92, the frame may be provided with an arm 106 (Figs. 1, 2, and 8) that carries at its left hand extremity an apertured boss 107. This boss 107 is slidable on the rod 83. Felt dust excluding washers on opposite sides of the boss 107 may be provided and may be held in place by the bracket 108 fastened to the top of the boss 107.

The frame 92 is slidably supported not only on the guide rod 83, but is also guided by the lead screw 59. In this way, the lead screw 59 serves to prevent any angular motion of the frame 92 about the axis of the rod 83.

The manner in which the lead screw 59 is used as a guide is shown most clearly in Figs. 9 and 11.

Thus, the lead screw 59 passes through bushings 109 and 110 that are supported by the frame 92. These bushings have internal cylindrical apertures 111 that form a slide fit over the threads of the lead screw 59.

The sleeves 109 and 110 are shown as disposed in slots 112 formed between the arms 113 and

114 projecting from the front edge of the frame 92. The sleeves are held in place by the aid of screws 115, accommodated in the upper arm 114, and projecting into the annular groove 116 provided on each of the sleeves 109 and 110.

The lead screw 59 is coupled to the frame 92 for traversing the frame by the aid of a mutilated nut 117 (Figs. 4 and 9). This mutilated nut is shown as mounted at the front edge of a sheet metal support 118 (see also Figs. 7 and 8). This sheet metal support is attached to a pivot shaft 119 located between the legs of frame 92. This shaft 119 is pivotally supported in the frame 92 by the pivot screws 120 (Figs. 7 and 8).

Resilient means are provided for urging the mutilated nut 117 downwardly into co-operative contact with the lead screw 59. For this purpose the frame 92, as shown most clearly in Fig. 4, carries a leaf spring 121. This leaf spring is bifurcated at its left hand edge, as shown most clearly in Fig. 4, to accommodate the head of one of the screws 122 that attach the mutilated nut 117 to the frame 118. A stiffening leaf spring 123 is also provided. Both these leaf springs are attached to the frame 92 adjacent the edge of an opening 124 that is formed in the top of the frame (Figs. 4 and 9). This opening is large enough to pass the mutilated nut 117 as it is moved upwardly out of contact with the lead screw 59.

When the mutilated nut 117 is in the active position of Fig. 4, rotation of the lead screw 59 is such that the frame 92 of the stylus head 91 is moved from right to left, as viewed in Fig. 1. Thus, the recording begins at the outer edge of the blank 1 and progresses toward the center thereof. Of course, the arrangement may be reversed if desired.

The position of the stylus 2 on the record blank 1 may be indicated by the aid of a pointer arrangement. Such a pointer 125 (Fig. 5) is shown as co-operating with a scale 126 (see also Fig. 2). This scale 126 is supported on the front wall 88 of the cover member 87. The pointer 125 is arranged to be moved with the frame 92. For this purpose, the pointer 125 carries a lateral extension 127 which is fastened to the front edge of the frame 92.

When it is desired to lift the stylus head 91 off the record blank 1, the stylus head may be moved in a counter-clockwise direction about its pivot. This movement of the head 91 is such that it may also serve to urge the mutilated nut 117 out of contact with the lead screw 59. For this purpose, as shown most clearly in Figs. 4, 5, 15, and 17, the upper forward edge of the stylus head 91 carries an arm 128 having an upright portion 129. This upright portion 129 is arranged to co-operate with the lower surface of the nut 117 when the stylus head 91 is raised sufficiently. Thus, in the position illustrated in Fig. 17, the upright member 129 has contacted the nut 117 and has moved it up out of co-operative relation with the lead screw 59.

The lifting of the stylus head 91 and simultaneous lifting of the mutilated nut 117 may be accomplished by the aid of a lever 130 (Figs. 5, 7, 8, and 19). This lever is shown as pivotally mounted upon the pin 131 (Fig. 8) that has a threaded extension 132 fastened in the right hand side of frame 92. The forward end 133 of the lever 130 is knurled to provide a grip for the fingers of the operator. This forward end projects beyond the front cover portion 88, slotted for permitting operation of the lever 130.

The lever 130 is shown in the inactive position in Fig. 5. In this position its upper edge is spaced below a projection 134 (see particularly Fig. 10) that is carried at the top of the stylus head 91. However, as the lever 130 is moved in a clockwise direction, its upper edge engages the projection 134 and the stylus head 91 may be moved to the inactive position of Fig. 17.

Means are provided to lock the lever 130 releasably in either the inactive position of Fig. 5, or the active position of Fig. 17. For this purpose, lever 130 carries a segment 135 (see also Fig. 7). This segment 135 is provided on its inner face with a pair of tapered recesses 136 and 137. These recesses are adapted to co-operate with a pin 138 that is slidable in the right hand wall of frame 92 and is urged toward the right by a leaf spring 139. This leaf spring 139 is shown as fastened to one side of the frame 92 as by the bolt 140 (see particularly Figs. 8 and 10).

The free end of the pin 138 is rounded so that it moves readily into either one of the tapered recesses 136 and 137 as one or the other of them moves into alignment with the pin; and the pin is urged outwardly by the tapered walls of the recesses as the recesses are moved out of alignment with the pin. The lever 130, as seen in Fig. 7, is releasably locked in inactive position by the pin 138. When the lever 130 is moved upwardly, the pin 138 is urged toward the left, freeing the lever 130; and, upon continued movement, the pin 138 is urged by the spring 139 into the other recess 137. This position corresponds to the active position of the lifting lever 130, the stylus head 91 being lifted, and the mutilated nut 117 also being lifted.

In order to guide the movement of the lever 130, an overhanging bracket 141 (see particularly Figs. 5, 7, and 17) may be supported on the right hand wall of the frame 92. The segment 135 of lever 130 is disposed within the space defined by the bracket 141 and the frame 92.

The strength of spring 139 is such that the lever 130 may be retained in the position shown in Fig. 17 for any desired period, and against the force of spring 95 (Fig. 4). When the head 91 is thus freed, it may be moved by lever 130 transversely of the record blank 1 to any desired position, as, for example, to the beginning of a new record. After the new position is reached, the lever 130 may be returned to its inactive position of Fig. 5.

If, however, the apparatus is to be maintained out of use for a more extended period, the lever 130 may be hung on a bracket 142 (see particularly Figs. 1 and 2). This bracket 142 is shown as supported upon the main bracket 61. It forms a space in which the front end 133 of the lever 130 may be disposed as shown in the dotted lines in Fig. 1. When the lever 130 is thus disposed, the head 91 is in its lifted position.

In order to prevent violent movement of the frame 92 against the bracket 61 when the frame is moved to the extreme right hand inactive position, a spring buffer 143 (Fig. 1) is disposed around the right hand end of the guide rod 83.

Means are provided for automatically disconnecting the motor drive, as well as other electrical elements of the system, when the stylus head 91 reaches its innermost recording position. For this purpose, a micro-switch 144 (Figs. 1 and 2) is supported on the bracket 62, as by the aid of a member 145. This micro-switch has an operating spring member 146 projecting in the path of a pin 147 attached to the bracket 106.

As frame 92 moves toward the left, ultimately pin 147 operates member 146 and causes de-energization of the system.

In the process of removing or replacing a record blank 1, it is, of course, essential that the stylus head 91 be elevated so as to free the stylus 2 from the record blank. An arrangement is provided whereby it is assured that at least the stylus 2 will be elevated from the record when the coupling member 45 (Fig. 3) is lifted to release the blank 1. For this purpose a lifting bar 148 (Figs. 1, 2, 4, and 14) is provided which extends below the hook-like member 150 attached to the front of the stylus head 91. This lifting bar 148, as shown most clearly in Fig. 16, may be caused to engage the hook member 150 to lift the stylus 2 clear of the blank 1.

A mechanism is provided whereby movement of the lever 73 for moving the coupling flange 45 upwardly causes upward movement of the lifting bar 148. This lifting bar for that purpose is shown as supported at its right hand end in a link 151 (Figs. 1 and 2) that is journaled upon the lead screw shaft 57. At its left hand end the lifting bar 148 is fastened to the arm 152 that forms one element of a frame 153. This frame 153 is likewise journaled upon the shaft 57 and is confined between a collar 154 and the bearing boss 82.

The front portion 155 of the frame 153 extends directly in front of the worm 70, as shown most clearly in Figs. 3 and 14. Accordingly, when the lever 73 is moved to lift worm 70, it likewise engages the lower edge of the front portion 155 (see also Fig. 15), tilting the frame 153 upwardly and thereby moving the lifting bar 148 upwardly.

In this upward movement of the stylus head 91, the upright member 129 need not be moved sufficiently to move the mutilated nut 117 out of engagement with the lead screw 59. It is necessary only to release the stylus 2 from the record blank 1, thereby permitting removal and replacement of the record blank.

The inventor claims:

1. In a phonograph device, a stylus head, a frame for pivotally supporting said head, a lead screw extending transversely above the head for moving the frame, a mutilated nut movably carried by the frame for co-operating with said lead screw, a flat spring carried by the frame for resiliently urging the nut downwardly into engagement with said lead screw, means for lifting the head to inactive position, means for releasably holding said lifting means in lifting position, and means carried by the upper portion of the head for contacting the nut and urging it to disengaged position when the head is lifted.

2. In a phonograph device, a turntable for accommodating a disc record, means for driving said turntable, a stylus head, a lead screw for moving the head, and having an axis transverse to that of the table, and means constituting a drive from the table to the lead screw, comprising a driving member coaxial with the table, a driven wheel mounted on the lead screw and in co-operative relation with the driving member, a coupling member adapted to contact the upper surface of the disc record, and attached to the driving member, a spring urging said coupling member into contact with the record, means for lifting said coupling member off the record to permit removal or insertion of a record, and means operating to lift the stylus head clear of the record, and operated by said lifting means.

3. In a phonograph device, a stylus head, a

11

frame supporting the head, a lead screw co-operating with the frame to move the head in accordance with the rotation of the screw, a guide rod for the frame, about which the frame is adapted for free angular movement and means mounted on the frame and encircling the lead screw, forming an additional guide for the frame and restraining the frame against movement about the rod.

4. In a phonograph device, a stylus head, a frame supporting the head, a lead screw co-operating with the frame to move the head in accordance with the rotation of the screw, a guide rod for the frame, and one or more collars movably carried by the frame for adjustment with respect to said rod, and having interior cylindrical surfaces that form a running fit over the lead screw.

5. In a phonograph device: a stylus head, a frame pivotally supporting said head, a lead screw extending transversely above the head for moving the frame, a mutilated nut movably carried by the frame and meshed with said lead screw, a spring connected to the frame and resiliently holding the nut in meshing engagement with said lead screw, linkage concatenated with the head and operable to lift the head to inactive position, a holding mechanism disposed in supporting relationship with respect to said linkage and adapted to support the linkage in its head-lifting position, an intermediate piece carried by an upper portion of the head and engageable with the nut to unmesh it against the action of said spring when the head is lifted a predetermined distance, and a lifting piece and mechanism associated therewith disposed adjacent the head and arranged to lift the head to a clearance position so that a record can be removed from the turntable.

6. In a phonograph device: a turntable, a stylus head disposed for movement through a generally radial path traversing the turntable, a frame pivotally supporting said head, a lead screw juxtaposed adjacent to the head for moving the frame through said path, a nut movably carried by the frame and movable thereupon into mesh with said lead screw, a spring carried by the frame and resiliently urging the nut into meshing engagement with said lead screw, linkage concatenated with the head and operable to lift the head to inactive position, an intermediate piece carried by an upper portion of the head for contacting the nut and urging it to disengaged position when the head is lifted to said inactive position, an elongated lifting piece and mechanism associated therewith disposed adjacent said generally radial path and arranged to lift the head at any point along its path of travel to a clearance position so that a record can be removed from the turntable, and a control member associated with said elongated piece and operable to actuate said elongated piece.

7. In a phonograph device: a turntable for accommodating a disc record, a drive for said turntable in driving relationship therewith, a stylus head facing said turntable, a lead screw having an axis transverse to that of the table and arranged to move the head through a path of travel, a driving member coaxial with and overlying the table, a wheel mounted on the lead screw in cooperative driven relation with the driving member, a coupling member attached to the driving member and disposed to contact the upper surface of the disc record and be turned thereby, a spring acting upon said coupling mem-

12

ber and urging said coupling member into contact with the record, a lever mechanism connected with said coupling member to lift said coupling member off the record to permit removal or replacement thereof, and an assembly associated with the stylus head and operated by said lever mechanism for lifting the stylus head clear of the record.

8. In a phonograph device: a turntable for accommodating a disc record, a drive for said turntable in driving relationship therewith, a stylus head facing said turntable, a lead screw arranged to move the head through a path of travel and having an axis transverse to that of the table, a driving member coaxial with and overlying the table, a wheel mounted on the lead screw in cooperative driven relation with the driving member, a coupling member attached to the driving member and disposed to contact the upper surface of the disc record and be turned thereby, a lever mechanism connected with said coupling member to lift said coupling member off the record to permit removal or replacement thereof, an assembly associated with the stylus head and operated by said lever mechanism for lifting the stylus head clear of the record, a lifting bar extending along the path of travel of a part associated with the stylus head, and a linkage in cooperative relationship with the lifting bar and arranged to actuate the lifting bar to lift the stylus head clear of the record at any point along its path of travel.

9. In a phonograph device: a stylus head, a frame pivotally supporting the head, a lead screw cooperating with the frame to move the head forwardly or backwardly in accordance with the direction of rotation of the screw, a guide rod for the frame upon which the frame is freely carried, a guide member mounted on the frame and encircling the lead screw to restrain the frame against angular movement about the guide rod, a feed nut carried upon the frame and normally meshed with the feed screw to establish a driving relationship, and an interlock mechanism coupled with the stylus head and actuatable to unmesh the feed nut from the feed screw.

10. In a phonograph device: a stylus head, a frame pivotally supporting the head, a lead screw cooperating with the frame to move the head forwardly or backwardly in accordance with the direction of rotation of the screw, a guide rod for the frame upon which the frame is freely carried, a guide member mounted on the frame and encircling the lead screw to restrain the frame against angular movement about the guide rod, a lifting lever and intermediate linkage coupled to the stylus head whereby the head may be lifted to an inactive position, and a lifting mechanism associated with the stylus head and automatically actuated by an assembly forming a part of the phonograph device to lift the stylus head to an inactive position whenever said assembly is caused to perform a predetermined operation.

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