

March 8, 1949.

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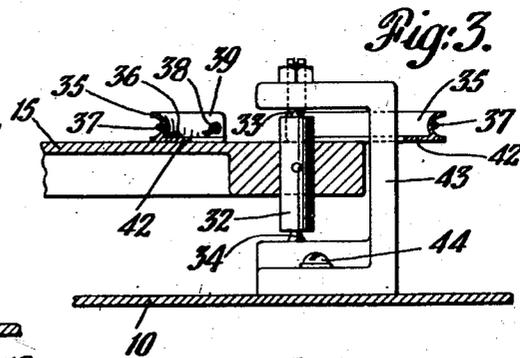
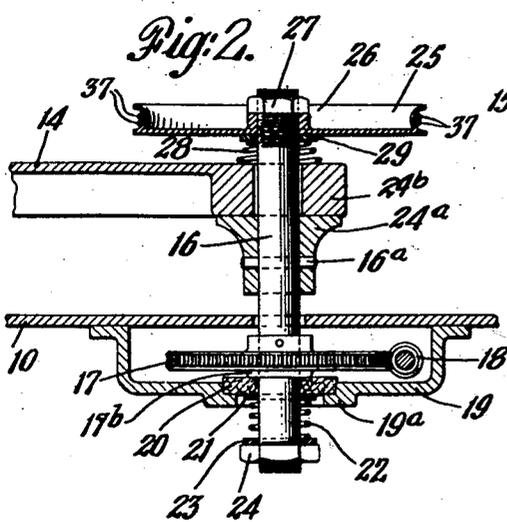
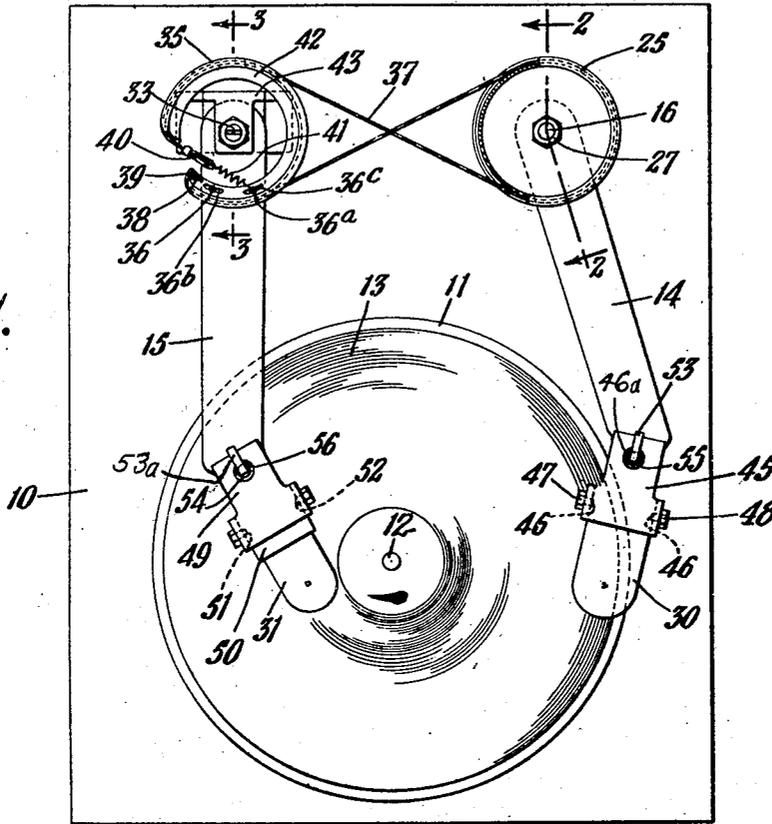
2,464,064

UNIVERSAL REPRODUCER HEAD MOUNTING

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2 Sheets-Sheet 1

Fig. 1.



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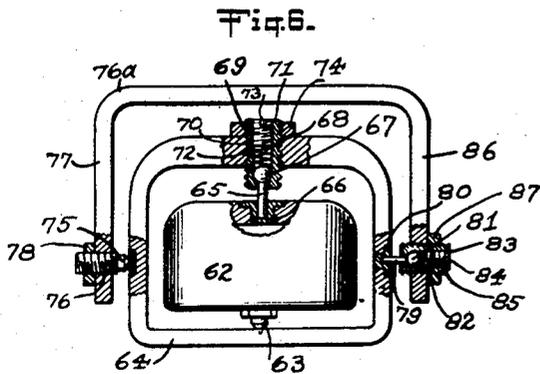
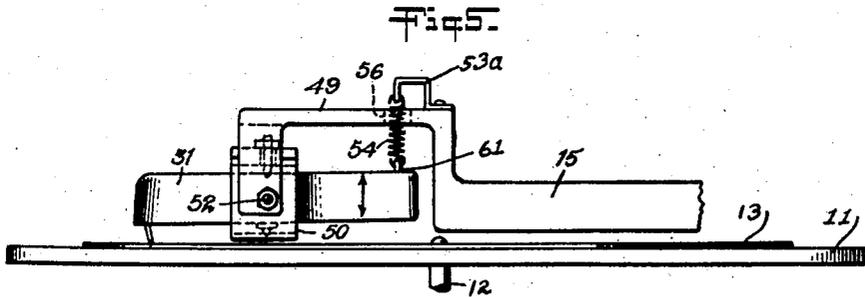
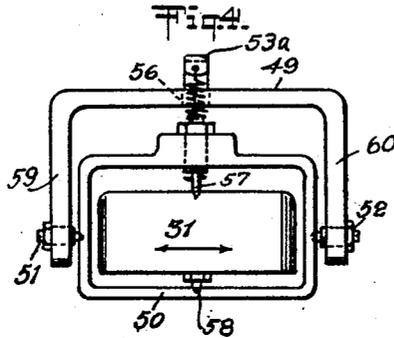
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2 Sheets-Sheet 2



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# UNITED STATES PATENT OFFICE

2,464,064

## UNIVERSAL REPRODUCER HEAD MOUNTING

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Application March 31, 1944, Serial No. 528,817

1 Claim. (Cl. 274—24)

This invention relates to phonographic dictating machines, and more particularly to a reproducer head mounting in which said head is pivoted on horizontal and vertical axes passing through the center of gravity on two pairs of yieldable bearings which permit slight horizontal and vertical movements of the reproducer head during reproduction.

One object is to provide a dictating machine of the above nature which will be simple in construction, inexpensive to manufacture, easy to install and manipulate, ornamental in appearance, and very efficient and durable in use.

With these and other objects in view there have been illustrated upon the accompanying drawings two forms in which the invention may conveniently be embodied in practice.

In the drawings,

Fig. 1 represents a top view of a recording and reproducing phonograph embodying the present invention.

Fig. 2 is a sectional view of the same, taken along the broken line 2—2 of Fig. 1, looking in the direction of the arrows.

Fig. 3 is a sectional view similar to Fig. 2, taken along the line 3—3 of Fig. 1, looking in the direction of the arrows.

Fig. 4 is an end view of the pickup arm showing how the pickup head is mounted therein.

Fig. 5 is a side view of the same showing the record and turntable located beneath the pickup head.

Fig. 6 is an end cross sectional view of a modified form of mounting for a pickup head.

The present application is a continuation in part of my prior application Serial No. 488,829, filed May 28, 1943, entitled "Pickup feed mechanism for phonographs," patented August 29, 1944, No. 2,357,033.

This invention is an improvement over the invention disclosed in my prior Patent No. 2,316,637 entitled "Phonograph record scanning devices," of April 13, 1943.

The invention is particularly adapted for operation in connection with a dictating machine of the type disclosed in my Reissue Patent No. 22,183 of September 22, 1942, entitled "Apparatus for recording sound on thin disks"; in my Patent No. 2,133,596 of October 18, 1938, entitled "Feed mechanism for disk recording machines"; in my Patent No. 2,213,936 of September 3, 1940, entitled "Electrodynamical pickup," and in my Patent No. 2,250,242 of July 22, 1941, entitled "Disk dictating machines."

In the reproduction of disk sound records having closely-spaced relatively shallow embossed grooves, there is sometimes a tendency for the pickup needle to leave its proper groove due to lateral displacing forces caused by the friction of the record, sudden shocks, or the tipping of the record out of its true horizontal position, thus causing "skips" or "repeats" during the transcription. A discontinuous groove due to an interruption in the recording may also cause the pickup needle to "skip" or "repeat."

By means of the present invention the above and other disadvantages have been avoided and mechanism has been provided which will positively maintain the pickup stylus within the recorded groove.

In a dictating machine of this type a diamond-tipped stylus is generally employed in the recording head and generates a spiral sound groove in the record disk as the latter revolves with the turntable. The sound is recorded by means of the lateral vibrations of the stylus which produce lateral undulations in the groove.

In playing back or "transcribing" the record, a sapphire-tipped reproducing stylus is generally employed. This stylus is adapted to fit in the groove which vibrates the stylus laterally as the disk record rotates, causing corresponding oscillating voltages to be induced in the moving coil of the pickup head.

In the present invention the feed mechanism for the pickup arm comprises a pulley on the pickup arm shaft which is driven by a crossed cable from a pulley on the recorder arm shaft, said cable having a spring take-up to maintain a constant friction on the shaft pulleys. This friction is determined by the smoothness of the pulley surfaces and by their diameters, as well as by the tension on the spring. The friction should be so adjusted as to permit relatively easy movement of the reproducing pickup arm to facilitate handling, and to produce tight enough control so that accidental shocks will not move the pickup arm from the normal position as held there by the friction. The feed on the reproducing stylus should follow exactly the feed produced on the record by the recording stylus; therefore, the pulleys must be of the same diameter, and the radius of rotation of the reproducing stylus must be equal to the radius of rotation of the recording stylus when the record was made. Furthermore, the two arms must be symmetrically placed so that when swung past the center of the record, their styli must be equal amounts ahead or behind the center, or pass exactly

through the center, whichever position is the most desirable one.

As herein illustrated, the well known principle of bending the end portions of the recording and reproducing arms is employed so as to provide for a substantially tangential contact between the styli and the record grooves in the usable portion thereof. This has the obvious advantage of giving better sound recording and reproduction. It also serves to eliminate the effect of any lateral forces, due to frictional contact, which would tend to move the stylus out of its groove.

Referring now to the drawings in which like reference numerals denote corresponding parts throughout the several views, the numeral 10 indicates the base of a dictating machine, which is provided with a horizontal turntable 11, mounted to rotate above said base, and which is adapted to be driven by means of a vertical spindle 12, which in turn is driven by a suitable motor, not shown.

Mounted upon the turntable for rotation therewith is a thin disk record tablet 13, preferably made in accordance with the specifications of the above-mentioned Reissue Patent No. 22,133.

Sound grooves are adapted to be engraved or embossed in the record tablet 13 by means of an electrically-actuated recording head 30, carrying a recording stylus, not shown, and adapted to be swung in an arc over the turntable 11, by means of an angular recording arm 14, frictionally secured upon a vertical feed shaft 16, which said arm 14 loosely surrounds. Below the base 10, the shaft 16 has rigidly secured thereto a worm gear 17 which meshes with a worm 18 driven by a motor or other source of power not shown.

The worm gear 17 and the worm 18 are adapted to be enclosed by a protective casing 19 secured to the underside of the base 10, and said casing is provided at its center with a seat 19a for a bearing disk 20 which is adapted to engage a hub 17b of said worm gear 17. Below the bearing disk 20, provision is made of a washer 21 which is pressed against said disk by a coiled spring 22, the lower end of which is seated upon a second washer 23, which in turn is supported by an adjustable nut 24 located upon the lower end of the shaft 16.

Provision is also made of a power head 24a, connected by a pin 16a to the shaft 16 and having a slip-friction engagement with the under-surface of a rear hub 24b of the recording arm 14.

By means of this construction it will be seen that by varying the pressure of the spring 22, and adjusting the nut 24, the amount of friction between the bearing disk 20 and the hub 17b may be controlled.

It will be understood that by driving the recording arm through the slip-friction power head 24a, backlash will be entirely avoided.

The sound vibrations recorded in the embossed spiral grooves of the record 13 are adapted to be reproduced or "transcribed" by means of a sapphire-tipped stylus carried by the reproducing or pickup head 31 mounted upon the pickup arm 15.

In order to transmit power from the recording arm shaft 16 to the pickup arm 15 for swinging the pickup arm 15 at a constant speed across the record and in the opposite direction from the motion of the recording arm 14, provision is made of a pair of hollow metal pulleys 25 and 35 mounted upon the upper ends of the shafts 16 and 32 respectively, said pulleys being yieldably

connected together by means of a metal cable 37, preferably made of Phosphor bronze, and known in the trade as "radio dial cable," as will be hereinafter fully described.

The pulley 25 is provided with a central up-standing collar 26, upon which a nut 27 is seated, said nut being screwed upon the upper end of the feed shaft 16. Below the pulley 25, provision is made of a spring 28 which presses downwardly upon the rear end of the recording arm 14 and upwardly upon a washer 29, which in turn engages the under surface of said pulley 25.

The shaft 32 of the reproducing arm 15 is relatively short and is mounted to rotate between a pair of cone-bearings 33, 34 which are carried by a U-shaped bracket 43 attached by a headed screw 44 to the base 10 of the dictating machine.

The pulley 35 is provided with a cutaway sector, on one side of which is an inwardly extending vertical flange 39 to which one end 38 of the cable 37 is secured, said pulley 35 being secured to the pickup arm 15 in any suitable manner, as by a pair of screws 36, 36a, adjustably located in a pair of arcuate slots 36b, 36c in a horizontal returned lip 42 of said pulley 35.

The cable 37 makes two turns around the pulley 25, as clearly shown in Fig. 2, to provide a non-slipping connection therewith, and the free end 40 of said cable is secured to an adjustable coiled take-up spring 41, which in turn is secured to the screw 36a on the pulley 35.

The recording head 30 is embraced by a raised yoke plate 45 integral with the recording arm 14, and is mounted, preferably at its center of gravity, upon a pair of horizontal pivot screws 46 secured to a pair of legs depending from said yoke plate 45. A pair of heads 47, 48, are provided on the ends of the pivot screws 46, and a constant lifting force will be exerted upon the rear of the recording head 30 by means of a light coil tension spring 46a secured to a bracket member 53 passing through an aperture 55 in the yoke plate 45. The recording stylus will thus be pressed with a constant force upon the record. The mounting of the recording head is similar to that disclosed in my prior application, Serial No. 463,791, filed October 29, 1942, entitled "Stylus head mountings for dictating machines," patented July 25, 1944, No. 2,354,558.

The pickup head 31 is embraced by a raised yoke plate 49, similar to the yoke plate 45, and said head 31 is mounted, preferably at its vertical center of gravity on a pair of vertical cone pivots 57, 58 in a small ring-shaped carriage 50 which is pivoted on a pair of horizontal pointed pins 51, 52, the axis of which is at right angles to the longitudinal axis of the pickup arm 15, said pins being mounted in a pair of legs 59, 60 depending from the yoke plate 49. By means of this mounting on both vertical and horizontal pivots, the pickup head will be permitted to move about 1/4" in each direction. The pickup head 31 is pressed against the record with a constant pressure by means of a lifting coiled spring member 54 passing through an aperture 56, said spring member being secured at its lower end to a pin 61 on the pickup head 31 and at its upper end to a bracket 53a mounted on the rear of the yoke plate 49.

It is well known that in all disk records, there is a certain amount of eccentricity, and this is particularly the case with thin plastic records. The action of heat alone will often render a record oval-shaped by the amount of several grooves; therefore, the reproducing stylus when

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connected to a feed mechanism must have a certain amount of play in order to take care of the eccentricity. The tension coil spring 54 located at the back of the pickup head serves the combined function of forcing the pickup needle against the record and yieldably maintaining the pickup head in its normal centralized position.

It will be understood that the recorder feed shaft 16 and its pulley 25 are driven constantly, so that the pickup feed cable 37 will also be in constant motion, even though the recording arm will normally be locked against movement while the record is being reproduced by the pickup.

#### Modified form

In the modified form of the invention shown in Fig. 6, the numeral 62 indicates a pickup head which is provided with a vertical cone bearing pin 63 at its bottom which is pivoted in a tubular carriage 64 similar to the carriage 50 of the first form of the invention.

At the top of the head 62, provision is made of a short hinge pin 65, which consists preferably of a hardened drill rod, and has a drive fit at its lower end in a cylindrical recess in a socket 66, which in turn has a force fit in the top of the pickup head 62. The hinge pin 65 forms a seat at its upper end for a ball 67 which engages a coiled spring 68, the latter serving to maintain said ball 67 in resilient contact with the pin 65 at all times.

The upper end of the coiled spring 68 rests upon a screw plug 69, which is screwed into a tapped recess 70 in a ball retainer sleeve 71 mounted in the top of the tubular carriage 64. The sleeve 71 is adapted to be screwed into a tapped aperture 72 formed on the top of the carriage 64 and is adjustable vertically in said aperture by means of a kerf 73 formed in the top of the screw plug 69.

A lock nut 74 is mounted on the top of the sleeve 71 and is adapted to engage the top of the carriage 64 for holding the sleeve rigidly in adjusted position.

The tubular carriage 64 is adapted to be mounted on a pair of pivots located in the horizontal center of gravity of the pickup head 62, one of said pivots comprising an adjustable cone pin 75 screwed into a tapped aperture 76 in the left hand arm 77 of the yoke plate 76a, as clearly shown in Fig. 6. The horizontal pin 75 is adapted to be held in adjusted position by a lock nut 78 engaging the outside of the yoke arm 77.

On the right hand side of the yoke plate 76a, provision is made of a resilient ball and pin bearing similar to the ball and pin bearing at the top of the tubular carriage 64, and comprising a horizontal hinge pin 79 which is mounted with a drive fit in a socket 80 upon the right

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hand side of the tubular carriage 64, and being similar in all respects to the socket 66.

The pin 79 is adapted to rest against a ball 81, which is pressed by a coiled spring 82, the latter being held in adjusted position by means of a screw plug 83 having a kerf 84. The screw plug 83 is mounted in a tapped aperture in a ball retaining sleeve 85 which in turn is screwed into a tapped aperture in the leg 86 of the yoke 76a. A lock nut 87 serves to hold the sleeve 85 in adjusted position.

One advantage of the present invention is that the dictating machine is completely stabilized as far as its resistance to shock is concerned, and that in conjunction with the mounting of the stylus heads at their centers of gravity it is actually possible to reproduce when tilted at various angles and even when the machine is upside down.

While there have been disclosed in this specification two forms in which the invention may be embodied, it is to be understood that these forms are shown for the purpose of illustration only and that the invention is not to be limited to the specific disclosures but may be modified and embodied in various other forms without departing from its spirit. In short, the invention includes all the modifications and embodiments coming within the scope of the following claim.

Having thus fully described the invention, what is claimed as new, and for which it is desired to secure Letters Patents is:

In a sound reproducing machine for use with a rotatable disk record, a pickup arm mounted to swing over said record, a pickup head, means comprising pivots disposed respectively on horizontal and vertical axes passing through the center of gravity of said head for swingably supporting said pickup head on said pickup arm, said head having a stylus offset from said center of gravity, and a resilient element connected between said head and said arm for urging said stylus downwardly, whereby the bearing pressure of the stylus upon a record will be determined entirely by said element.

LINCOLN THOMPSON.

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