

Oct. 31, 1961

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3,006,652

PHONOGRAPH TONE ARM CONSTRUCTIONS

Filed April 9, 1959

3 Sheets-Sheet 1

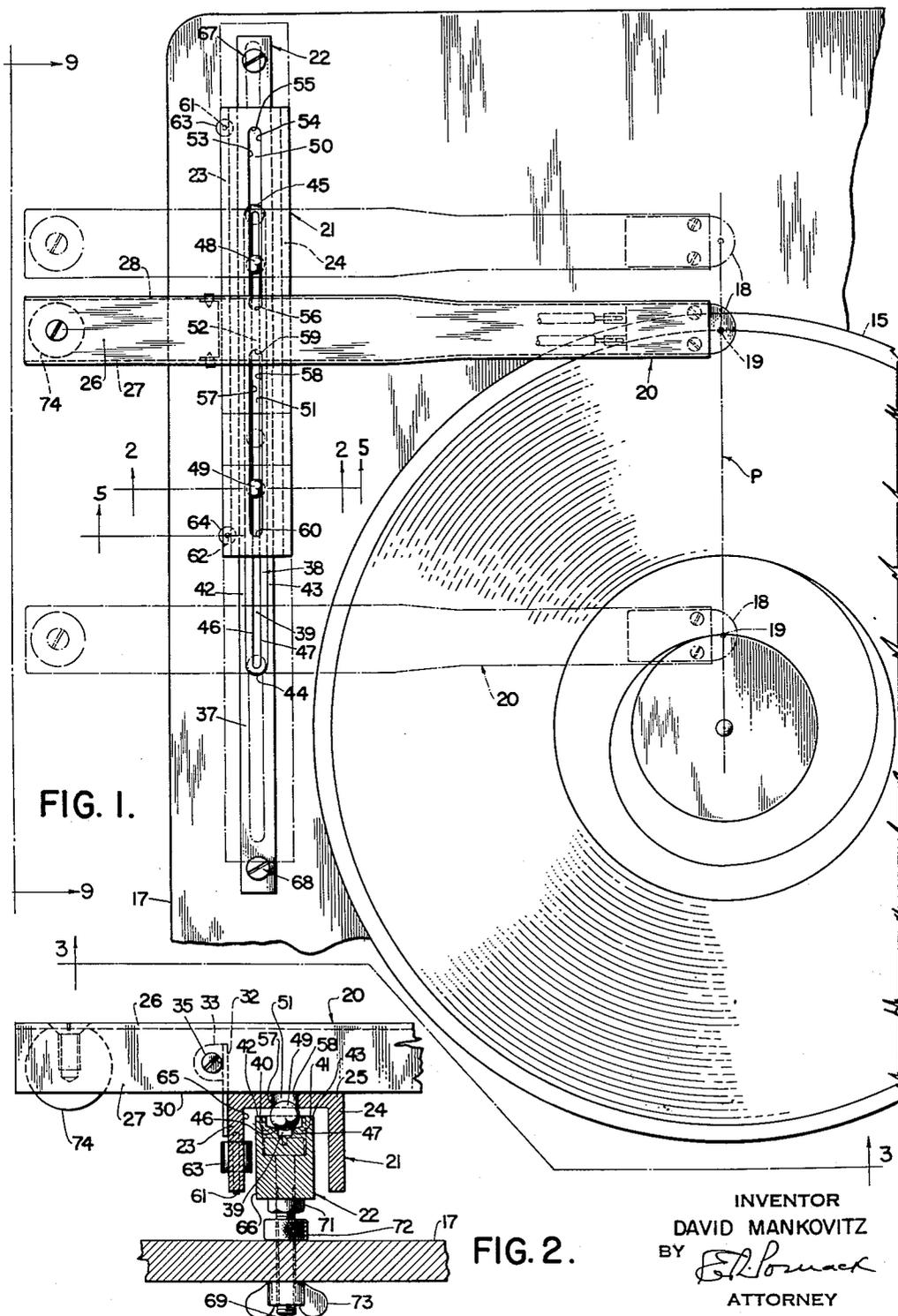


FIG. 1.

FIG. 2.

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3 Sheets-Sheet 2

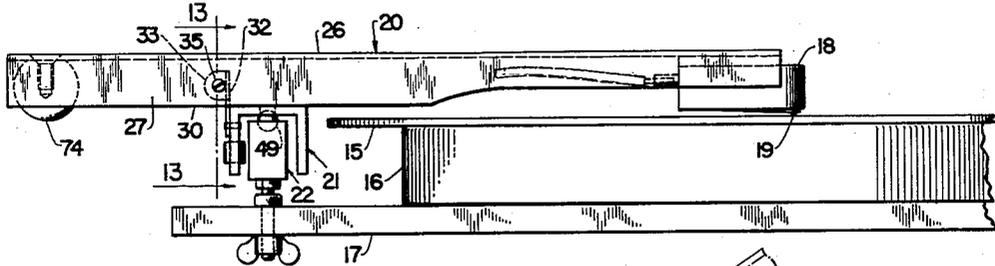


FIG. 3.

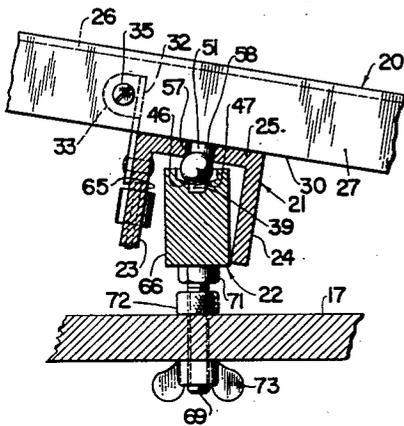


FIG. 4.

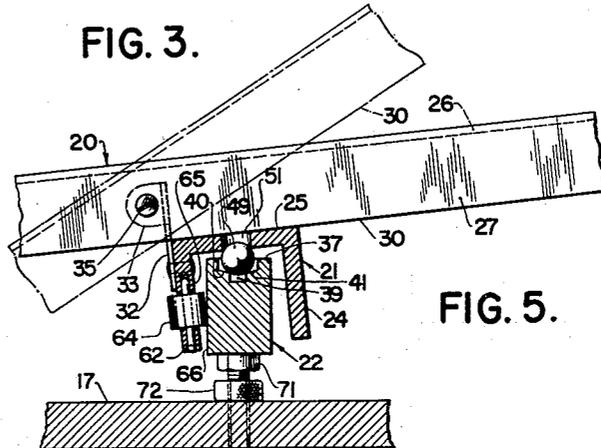


FIG. 5.

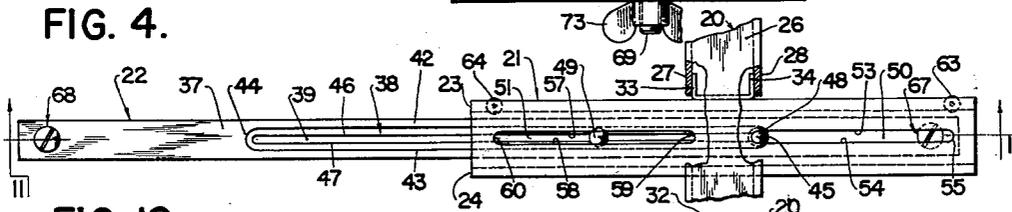


FIG. 10.

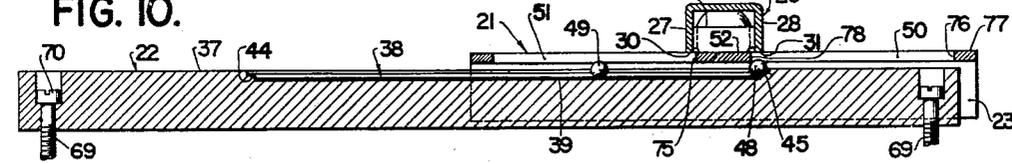


FIG. 11.

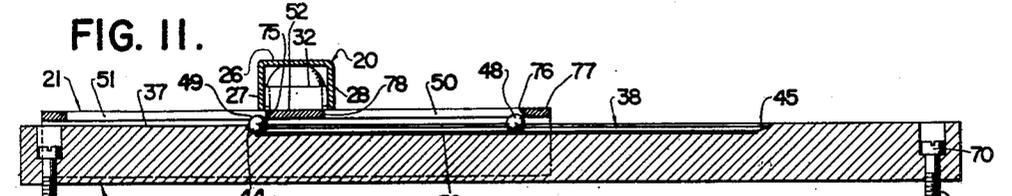


FIG. 12.

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PHONOGRAPH TONE ARM CONSTRUCTIONS

Filed April 9, 1959

3 Sheets-Sheet 3

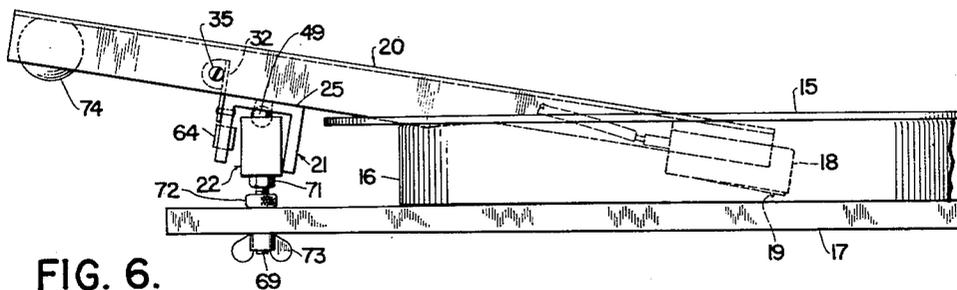


FIG. 6.

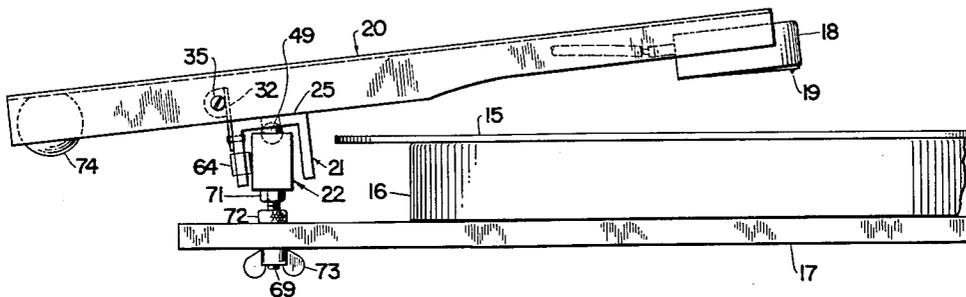


FIG. 7.

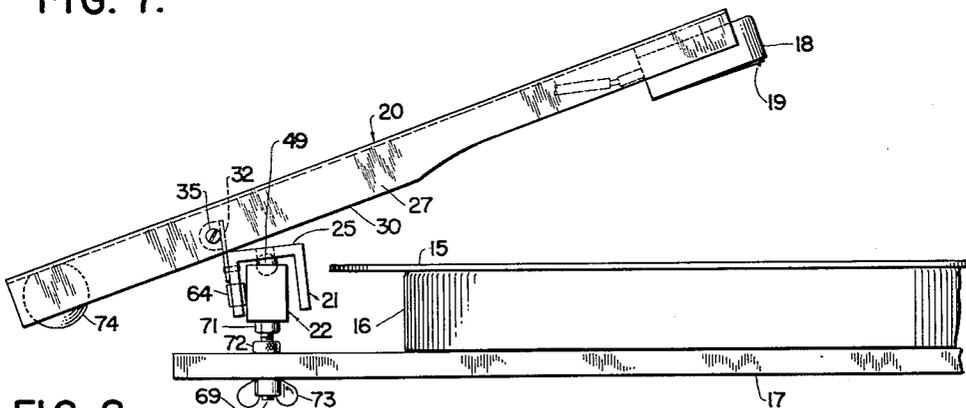


FIG. 8.

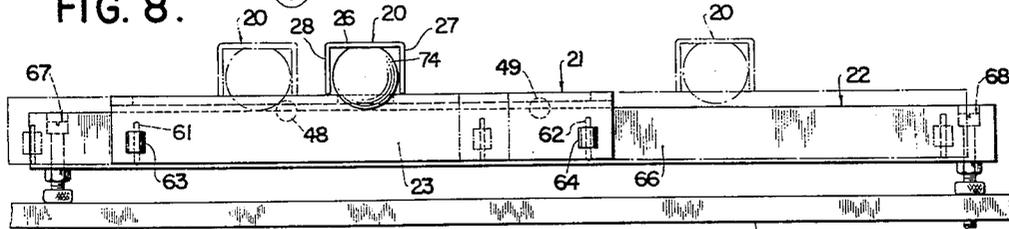


FIG. 9.

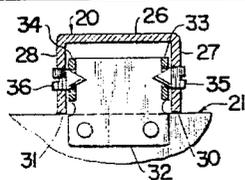


FIG. 13.

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3,006,652

PHONOGRAPH TONE ARM CONSTRUCTIONS

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14 Claims. (Cl. 274—23)

This invention relates to phonographs, and is particularly directed to phonograph tone arms.

In conventional phonograph constructions, the tone arms are pivotally mounted, so that as the needle advances inwardly towards the center of the record the path of the needle is in the form of an arc. It is therefore evident that the angle the arm makes with the radial line extending inwardly from the point of needle contact varies, producing different needle pressures in different convolutions of the record's spiral groove. Since, in such conventional constructions, the pressure of the needle upon the sound track is not uniform throughout the extent thereof, there is irregular wear on the groove walls, with the possibility of sound distortions and loss of fidelity. To correct this condition attempts have been made to eliminate the pivotal mounting for the arm and provide a track that would permit the arm to maintain a constant angle—preferably a right angle—with the radial line extending inwardly from the needle. Such attempts have been unsuccessful for various reasons, such as the complexity of the resulting apparatus, the unretractable position of the arm directly over the record thereby making access thereto difficult, and the requirement that the operator become accustomed to an unconventional manner of handling the tone arm and record. Moreover, in such prior attempts where the tone arm crossed over and above the record, a relatively short needle-carrying arm had to be pivotally attached to the arm, an arrangement resulting in a relatively short arcuate needle movement, causing exaggerated distortions when the needle encountered wavy or imperfect portions of the record.

It is an object of this invention to provide a tone arm construction having none of the aforesaid shortcomings, yet one in which the arm bears a constant operative tangential relation to the record radius at the needle contact point, thereby providing uniform pressures of the needle upon the groove walls in all the convolutions of the spiral path, and accordingly aiding in the production of undistorted sound results. And in the accomplishment of this objective, it is a further object of my invention to provide a relatively long tone arm retractably supported along a region laterally beyond the periphery of the record, the arm being movable along a track of novel construction and extending in a direction parallel to the record's radial line at the point of needle contact—the arrangement permitting a pivotal action of the arm in a vertical plane during the playing of the record, as well as upon an operative lifting of the needle from the record. And in accordance with a further objective of my invention, the arrangement is such as to permit said arm to be manipulated substantially in the manner of a conventional tone arm.

It is known that in conventional pivotally mounted tone arms there is constant wear at the single pivotal connection, so that after considerable use there is danger of a looseness occurring at this connection, with the consequent production of undesirable noises and with loss of tone fidelity. It is an object of my invention to eliminate this shortcoming by providing an extended path along which the tone arm moves, thereby eliminating excessive wear at any one point. And in this aspect of my invention it is a further object to provide effective rolling means between the tone arm and track members, the arrangement being such as to assure only rolling

engagement of such means with said members, thereby eliminating any sliding movement which could cause unwanted discontinuous operative movements of the needle.

It is a further object of this invention to enable the tone arm to be readily retracted, and to be moved with a minimum of frictional resistance while in its operatively retracted position.

Still further objects are the elimination of uneven wear on the needles, the provision of effective upper and lower limiting positions of the tone arm, the provision of means to permit a ready re-setting of the roller members in the event they are accidentally displaced, and the provision of means to effect a levelling of the track member supporting the roller members.

And it is my objective to provide a relatively simple and easily constructed device having the features above mentioned.

Other objects, features and advantages will appear from the drawings and the description hereinafter given.

Referring to the drawings,

FIG. 1 is a fragmentary plan view of the tone arm device of my invention shown in operative relation to a record, the full-line representation of the tone arm showing its position in the outermost record groove, the inner dot-dash representation thereof showing its innermost limiting position, the other dot-dash representation thereof showing a position laterally beyond and off the record.

FIG. 2 is a fragmentary enlarged section of FIG. 1 taken along line 2—2.

FIG. 3 is a side elevational view of FIG. 1 looking in the direction of arrows 3—3.

FIG. 4 is a view substantially like FIG. 2, but showing the tone arm tilted downwardly when it is in a position laterally off the record, as shown in the uppermost dot-dash representation of the tone arm of FIG. 1.

FIG. 5 is a view substantially like FIG. 2, the section being taken along 5—5, and showing the tone arm tilted upwardly when the needle is in spaced position above the record, the dot-dash lines indicating a further upwardly tilted position of the tone arm.

FIG. 6 is an elevational view, substantially like FIG. 3, but showing the full tone arm in the downwardly tilted position of FIG. 4.

FIG. 7 is an elevational view, substantially like FIG. 3, but showing the full tone arm in its upwardly tilted full-line position of FIG. 5.

FIG. 8 is an elevational view, substantially like FIG. 3, but showing the full tone arm in its upwardly tilted dot-dash position of FIG. 5.

FIG. 9 is a front elevational view of FIG. 1 looking in the direction of arrows 9—9.

FIG. 10 is a fragmentary plan view of the tone arm and track member, showing the ball members out of position and the tone arm carriage in one limiting adjusting position.

FIG. 11 is a section of FIG. 10 taken along line 11—11.

FIG. 12 is a view substantially like FIG. 11, but showing the tone arm carriage in the opposite limiting adjusting position.

FIG. 13 is a section of FIG. 3 taken along line 13—13.

In the embodiment of my invention illustrated, the record 15 is operatively supported by the turntable 16 positioned over the base panel 17, the cartridge 18 carrying the needle 19, all in known manner. The said cartridge is operatively carried by the novel tone arm 20 of my invention, said arm being movable, in a manner to be hereinafter explained, along the path P (FIG. 1) coincident with the record radius from the point of contact of the said needle 19.

The said tone arm 20 is supported upon and pivotally connected to the carrier member 21 which rides upon a track member, generally designated 22, said track mem-

ber being disposed laterally outwardly beyond the periphery of the record and affixed to said base panel 17. As clearly appears from the drawing, said track member extends in a direction parallel to said path P, that is, parallel to the record or turntable radius extending inwardly from the point of needle contact. In the particular form illustrated, the carrier member 21 is in the form of a channel comprising the legs 23 and 24 depending downwardly from the connecting top wall or web 25; and the tone arm 20 is also channel-shaped, having a top wall 26 and downwardly depending walls 27 and 28.

The tone arm 20 extends transversely across the carrier 21, the bottom edges 30 and 31 of the respective tone arm legs 27 and 28 being adapted to rest upon the said top wall 25 of the carrier. Affixed to the forward leg 23 of the carrier 21 is the bracket 32 having two ears 33 and 34 adjacent the inner surfaces of the respective legs 27 and 28 of the tone arm 20, said latter legs carrying the respective pivotal pins 35 and 36 which are in pivotal engagement with said ears 33 and 34. The arrangement is hence such that the carrier member 21 is adapted to support the tone arm with the latter resting on the said top wall 25 of the former as illustrated in FIG. 2 to 7, as well as with the tone arm supported only by the horizontal pivotal pins 35 and 36 as illustrated in FIGS. 5 and 8. It is thus evident that with the operative movement of the carrier along the track member 22 (in a manner to be hereinafter described), the tone arm will be carried along a path determined by said track member 22, regardless of whether the tone arm is resting directly upon the said top wall 25 of the carrier member, or is merely being pivotally supported in raised position by the said bracket 32.

The said track member 22 has along a portion of its upper surface 37 a depressed portion generally designated 38, this position comprising the medially disposed slotted track 39 flanked by the downwardly and inwardly sloping walls 40 and 41, and defined by the respective front and rear walls 42 and 43, and the end walls 44 and 45. In rolling engagement with the longitudinal edges 46 and 47 of said track 39 are the two ball members 48 and 49, the said walls 42 and 43 being spaced from said ball members so as to enable them to be in engagement only with said track edges 46 and 47. The aforesaid downwardly and inwardly sloping arrangement of said walls 40 and 41 enables said walls to serve as guides to direct said ball members for proper positioning upon said track edges, an arrangement which affords minimum frictional interference with the operative rolling movement of said ball members.

Disposed longitudinally within the upper wall 25 of the said carrier member 21 are the two equally proportioned and longitudinally aligned slots or upper track portions 50 and 51, these being separated by the intermediate wall portion 52. Slot 50 is defined by the respective front and rear longitudinal edges 53 and 54 and the opposite end walls 55 and 56; and slot 51 is defined by the respective front and rear longitudinal edges 57 and 58 and the opposite end walls 59 and 60. The said slots 50 and 51 are in registry with said slotted track 39, the preferred construction being such that the width of each of slots 50 and 51 is greater than the width of the slot 39, for reasons which will hereinafter appear. It is also preferred that the distance between the opposite limiting outer end walls 55 and 60 of the upper track slots 50 and 51 be less than the distance between the limiting outer end walls 44 and 45 of the lower slotted track 39.

Rotatably supported by pins 61 and 62 in the front wall 23 of the carrier member 21 are the two roller members 63 and 64, both of said latter members projecting rearwardly beyond the inner surface 65 of the wall 23 for rolling engagement with the front surface 66 of the track member 22. The arrangement is such that when the tone arm 20 is operatively lifted to the positions shown in FIGS. 5, 7 and 8, the rollers will engage said

surface 66 and permit an operative guided movement of the carrier member 21 and the tone arm 20 carried thereby along the longitudinal extent of said track member 22.

In the form illustrated, the track member 22 is adjustably supported upon the base panel by the opposite adjusting screws members 67 and 68. Each of these members comprises a bolt 69 the head 70 of which is countersunk in track member 22, the nut 71 underlying and supporting said track member, the adjusting nut 72 and wing nut 73 being in flanking engagement with the upper and lower surfaces of said base panel 17. By operatively manipulating the nuts 71, 72 and 73 in known manner, the track member 22 can readily be adjustably positioned and levelled for optimum rolling action of said ball members 48 and 49.

It is further to be noted that at the forward part of the tone arm is a conventional weighted member 74 for suitable balancing of said tone arm.

As is evident from the description hereinabove given, the carriage member 21 is rollably supported by the said ball members 48 and 49, the latter being rollably supported by the track member 22 and being guided by the slotted track 39 in a direction parallel to the aforementioned radial path P. Since the ball members ride only on the relatively closely spaced track edges 46 and 47, there is a minimum of friction to resist the rolling action. Inasmuch as the front and rear walls 23 and 24 of the tone arm carrier 21 are out of engagement with the track member 22 when the tone arm is in horizontal playing position, as illustrated in FIGS. 1, 2 and 3, the operative movement of the needle 19 within the spiral groove of the record 15 will be transmitted to the entire tone arm, with no resistance to such movement except the relatively insignificant resistance of the rolling ball members. There being no pivotal connection to permit rotation of the tone arm about a vertical axis, the only possible movement thereof is along a path defined by the track 39.

It is of importance to note that the upper track edges 57 and 58 of the carrier member 21 are, aforesaid, farther apart than the lower track edges 46 and 47, thereby providing an actuating grip upon the balls by said upper edges of greater magnitude than the resisting action of said lower track edges. In other words, as I have experimentally verified, the grip by the carrier member upon the relatively wide-spaced contacting portions of the ball members enables the inward radial movement of the needle 19 to be readily transmitted to the ball members for easy rolling engagement of the relatively closely-spaced contacting portions of the ball members with the lower track 39—sliding movement of the ball members and associated parts being entirely eliminated.

Because of the structure above described, the tone arm is at all times—during the entire operative movement of the needle along the spiral record groove—tangential to the groove curve at the point of needle contact, that is, at right angles to the radial line P. Because of the unchanging angle of the tone arm with respect to the groove convolutions, the objective of fidelity, among the other objectives hereinabove mentioned, are attainable with my invention.

It is further to be noted that there is no restriction to the vertical movement of the tone arm, so that it is adapted to accommodate itself to warped records or slightly wobbly turntables. The rolling engagement of the ball members with the lower track will permit the required vertical pivotal movement of the tone arm. Due to the length of the tone arm from the point of support to the needle, sound distortions due to warped records are reduced to a minimum.

When the tone arm is moved laterally off the record, to the position indicated by the uppermost dot-dash lines of FIG. 1, and then lowered to the position shown in FIGS. 4 and 6, the carrier member will be correspondingly tilted and the rear wall 21 thereof will engage the track 22, and prevent further downward movement of

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the tone arm. When the tone arm is lifted off the record, to the full line position shown in FIG. 5 and the position shown in FIG. 7, the carrier member 21 will be tilted as illustrated. Such tilting movements can be accomplished with a minimum of effort, because of the closely spaced track edges 46 and 47. If it is desired to lift the tone arm still higher—to the dot-dash position shown in FIG. 5 and the position shown in FIG. 8—that can also be readily accomplished through the pivotal connection of the tone arm and the said bracket 32.

In any of the raised positions of the tone arm, as illustrated, the rollers 63 and 64 are in engagement with the said forward surface 66 of the track member 22. Hence the tone arm can readily be moved, even when in inoperative positions, with little effort and a minimum of wear.

In initially setting the ball members, or in resetting them if they have been inadvertently displaced from their optimum positions, ball 48 is placed on the lower track 39 under slot 50 of the carrier member and ball 49 is placed on said lower track 49 under slot 51. The carrier 21 is then shifted to the right, to the position shown in FIGS. 10 and 11, whereby the edge 78 of said intermediate wall 52 will move ball 48 into its limiting position in engagement with the end wall 45. Thereafter the carrier is moved to the left, to the position shown in FIG. 12, whereby the edge 75 of said intermediate wall 52 engages and moves the ball 49 until it engages the opposite end wall 44. When this position is reached, the edge 76 of the carrier wall 77 will be in engagement with the ball 48. The slots 50 and 51 are so proportioned as to bring said ball members into said positions, which are predetermined to be their optimum operative positions.

In the above description, the invention has been disclosed merely by way of example and in preferred manner; but obviously many variations and modifications may be made therein. It is to be understood, therefore, that the invention is not limited to any specific form or manner of practicing same, except insofar as such limitations are specified in the appended claims.

I claim:

1. In a phonograph tone arm construction for operative use with a sound track disc and a pick-up element adapted for coaction with said disc along a predetermined radial line thereof, the combination of an elongated arm member supporting said pick-up element, a track member wholly disposed laterally beyond said disc and having an edge portion extending in a direction parallel to said radial line, roller means supported by said track member, said arm member being of a length greater than the radius of said disc and operatively extending outwardly beyond the periphery of the disc, said arm member being rollably supported by said roller means, and connecting means between said members and holding said arm member in fixed angular relation to the longitudinal extent of said track member, said roller means being in constant engagement with said edge portions whereby the operative movement of said pick-up member will cause said arm member to rollably move along said track member in the direction of said edge portion.

2. In a phonograph tone arm construction for operative use with a record supported upon a turntable, the combination of a tone arm member carrying a needle positioned for operative engagement with said record, a substantially horizontal track member having an elongated edge portion in intersecting relation to said tone arm member, roller means supported by said track member substantially at the level of said needle and rollably and pivotally supporting said tone arm member, and connecting means between said members and holding said tone arm member in fixed angular relation to the longitudinal extent of said edge portion, said roller means being in constant engagement with said edge portion, whereby the operative inward movement of said needle

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with respect to the record will cause said tone arm member to rollably move along said track member in the direction of said edge portion.

3. In a phonograph tone arm construction for operative use with a record supported upon a turntable, the combination of a tone arm member carrying a needle positioned for operative engagement with said record, a substantially horizontal track member wholly disposed laterally beyond said record and extending transversely with respect to said tone arm member, said tone arm member being of a length greater than the radius of said record and operatively extending outwardly beyond the periphery of the record, roller means supported by said track member and rollably supporting said tone arm member said track member having two spaced parallel edge portions extending longitudinally thereof, and connecting means between said members and holding said tone arm member in fixed angular relation to the longitudinal extent of said track member, said roller means being in constant engagement with said edge portions, whereby the operative inward movement of said needle with respect to the record will cause said tone arm member to rollably move along said track member in the directions of said edge portions.

4. In a phonograph tone arm construction for operative use with a record supported upon a turntable, the combination of a tone arm member carrying a needle positioned for operative engagement with said record, a substantially horizontal track member in intersecting relation to said tone arm, roller means supported by said track member substantially at the level of said needle and rollably and pivotally supporting said tone arm, said track member having two spaced parallel edge portions extending longitudinally thereof, and separate pivotal connecting means between said members having a substantially horizontal pivotal axis, whereby said tone arm can be pivotally moved substantially vertically but will be held in fixed angular relation to the longitudinal extent of said track member, said roller means being in constant engagement with said edge portions whereby the operative inward movement of said needle with respect to the record will cause said tone arm to rollably move along said track member in the direction of said edge portions.

5. In a phonograph tone arm construction for operative use with a record supported upon a turntable, the combination of a tone arm member carrying a needle positioned for operative engagement with said record, a substantially horizontal track member in intersecting relation to said tone arm member, a plurality of spaced ball members rollably supported upon said track member, said track member having two spaced parallel edge portions extending longitudinally thereof, a tone arm carrier member rollably supported by said ball members and movable along the longitudinal extent of said edge portions, said tone arm member being attached to said carrier member in fixed angular relation to the longitudinal extent thereof, said roller means being in constant engagement with said edge portions, whereby the operative inward movement of said needle with respect to the record will cause said carrier member and tone arm member to move along said track member in the direction of said edge portions.

6. In a phonograph tone arm construction, the combination according to claim 5, said carrier member being channel-shaped and comprising a top wall and two downwardly depending walls in flanking relation to said track member, said tone arm being in resting engagement with said top wall, said top wall overlying and being in rollable engagement with said ball members.

7. In a phonograph tone arm construction, the combination according to claim 5, said carrier member having affixed thereto a pivotal connector element with a substantially horizontal pivotal axis, said tone arm being pivotally attached to said connector element, whereby

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said tone arm can be pivotally moved in a substantially vertical plane.

8. In a phonograph tone arm construction, the combination according to claim 5, said carrier member being channel-shaped and comprising a top wall and two downwardly depending walls in flanking relation to said track member, said tone arm being in resting engagement with said top wall, said top wall overlying and being in rollable engagement with said ball members, said two downwardly depending walls of said carrier member being in spaced relation to said track member, whereby the carrier member can be pivoted upon said ball members about a substantially horizontal axis, thereby to permit a corresponding pivotal movement of said tone arm in a substantially vertical plane.

9. In a phonograph tone arm construction, the combination according to claim 5, said carrier member being channel-shaped and comprising a top wall and two downwardly depending walls in flanking relation to said track member, said tone arm being in resting engagement with said top wall, said top wall overlying and being in rollable engagement with said ball members, said two downwardly depending walls of said carrier member being in spaced relation to said track member, whereby the carrier member and the supported tone arm can be pivoted upon said ball members about a substantially horizontal axis, one of said depending walls having roller means proportioned and positioned for rolling engagement with said track member when said carrier member is in a predetermined operatively pivoted position.

10. In a phonograph tone arm construction for operative use with a record supported upon a turntable, the combination of a tone arm member carrying a needle positioned for operative engagement with said record, a substantially horizontal track member in intersecting relation to said tone arm, said track member having along the upper portion thereof a slotted track defined by two longitudinal track edges and opposite end walls, spaced roller members in rollable engagement with said track edges, a tone arm carrier member having a horizontal wall with a longitudinal slotted portion thereof in substantial longitudinal registry with said slotted track, said

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horizontal wall of the carrier member being rollably supported by said roller members, said slotted portion having longitudinal edges in rollable engagement with said roller members, said tone arm being attached to said carrier member in fixed angular relation to the longitudinal extent thereof, whereby the operative inward movement of said needle with respect to the record will cause said carrier member and tone arm to move along said track member in the direction of said track edges.

11. In a phonograph tone arm construction, the combination according to claim 10, the width of said slotted portion of the carrier member being greater than the width of said slotted track.

12. In a phonograph tone arm construction, the combination according to claim 10, said roller members comprising two ball members, said slotted portion of the carrier member comprising two longitudinally aligned slots separated by an intermediate wall, each of said ball members being operatively disposed below one of said slots.

13. In a phonograph tone arm construction, the combination according to claim 10, said roller members comprising two ball members, said slotted portion of the carrier member comprising two longitudinally aligned slots of equal proportions, said slots being separated by an intermediate wall, each of said ball members being operatively disposed below one of said slots, the distance between the farthest opposite ends of said slots being less than the length of the slotted track of said track member.

14. In a phonograph tone arm construction, the combination according to claim 10, said track member having along the upper portion thereof two longitudinally extending downwardly and inwardly sloping walls at opposite sides of said slotted track.

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