July 25, 1939. R. DALLY 2,166,986

PHONOGRAPH

Filed Feb. 18, 1938 4 Sheets-Sheet 1

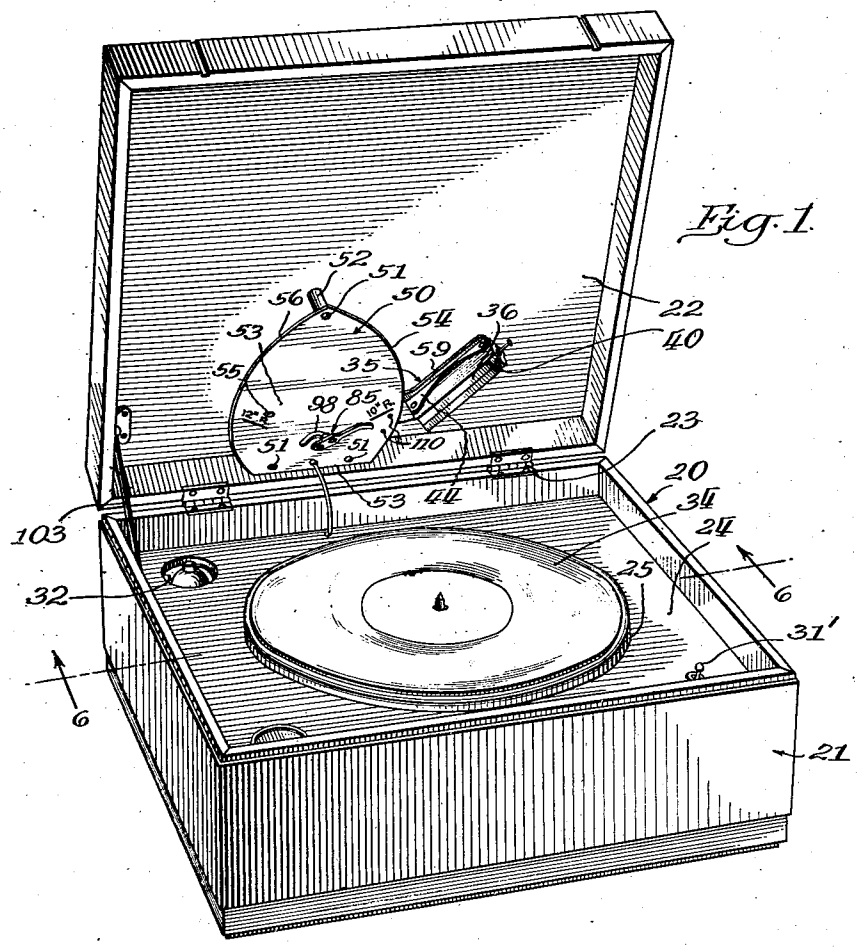


Fig. 1.

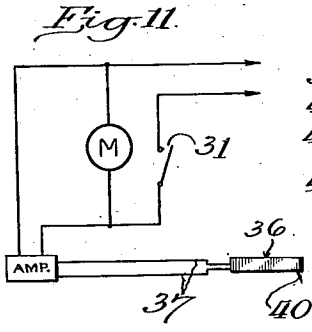


Fig. 11.

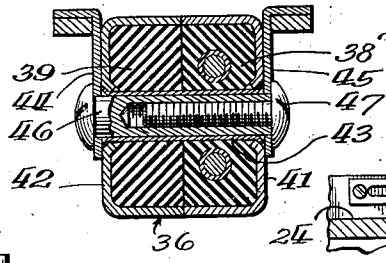


Fig. 10.

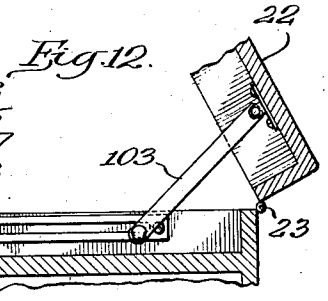


Fig. 12.

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PHONOGRAPH

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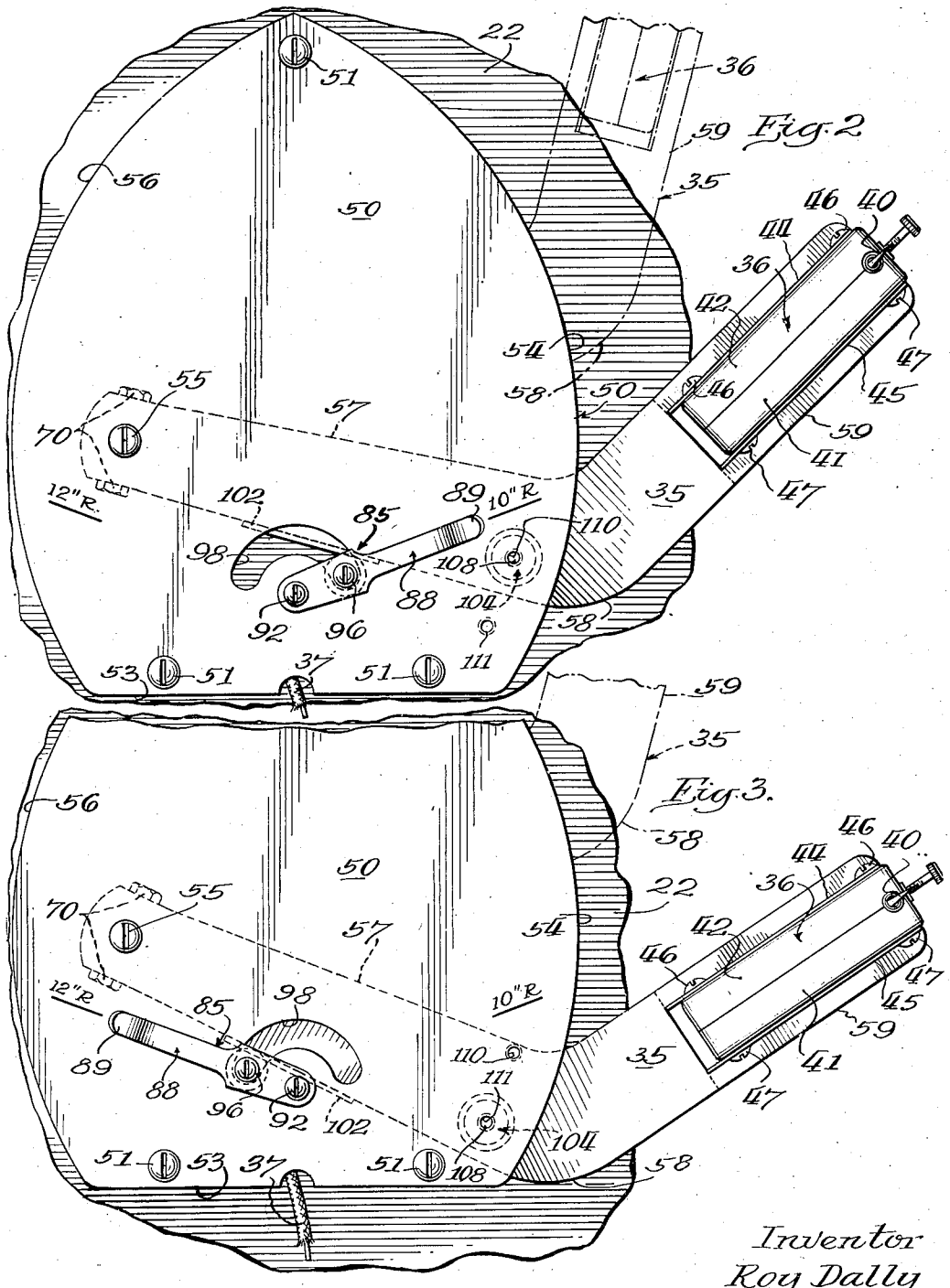


Fig. 2.

Fig. 3.

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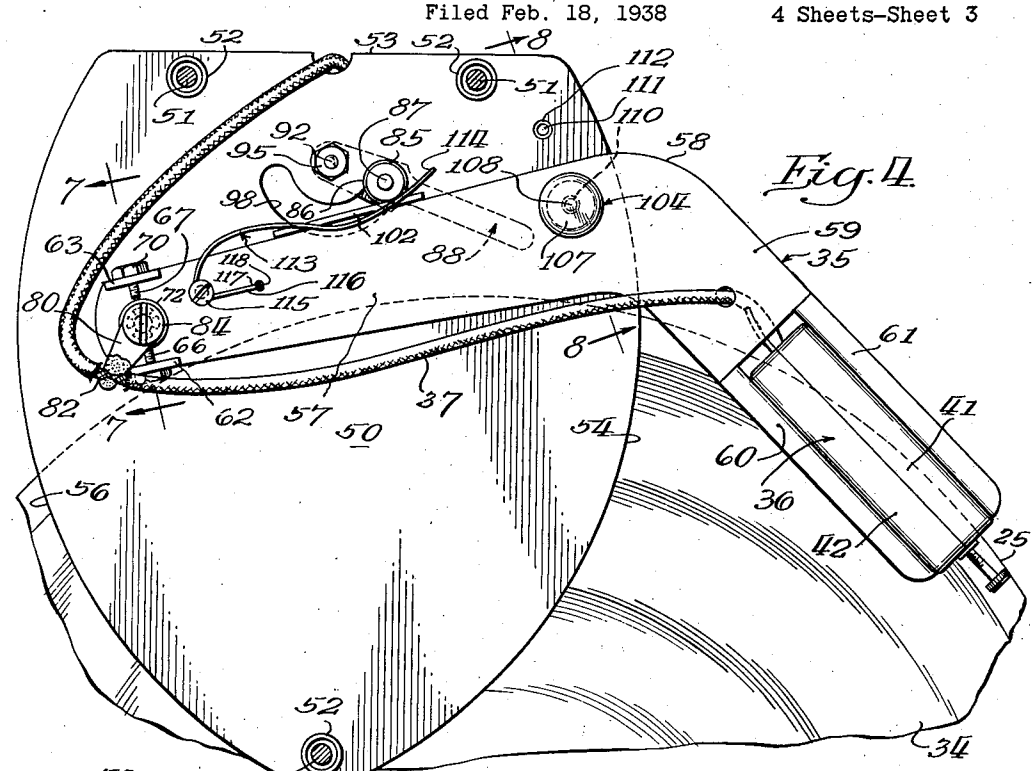


Fig. 4.

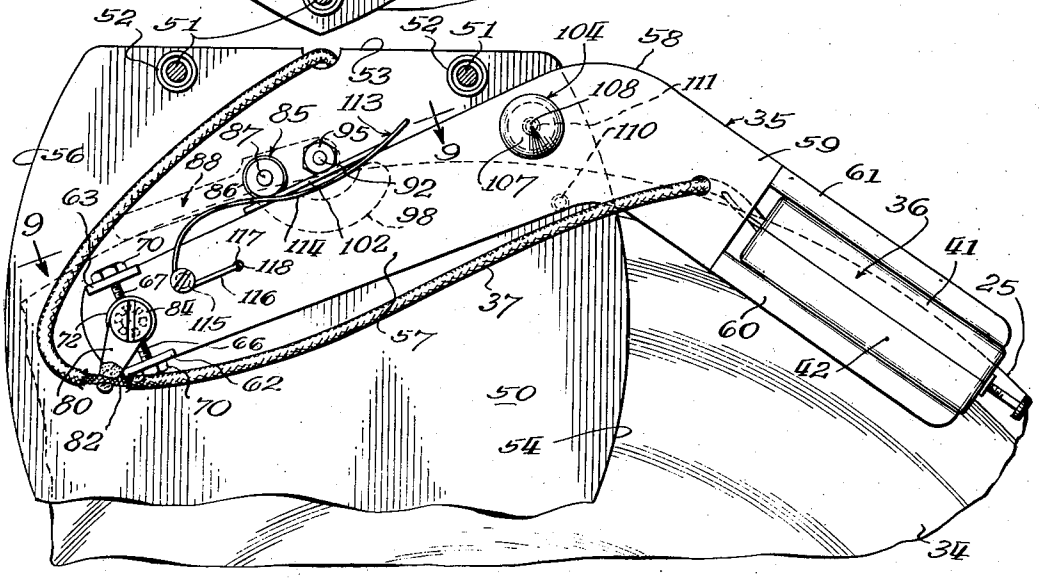


Fig. 5.

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Fig. 6.

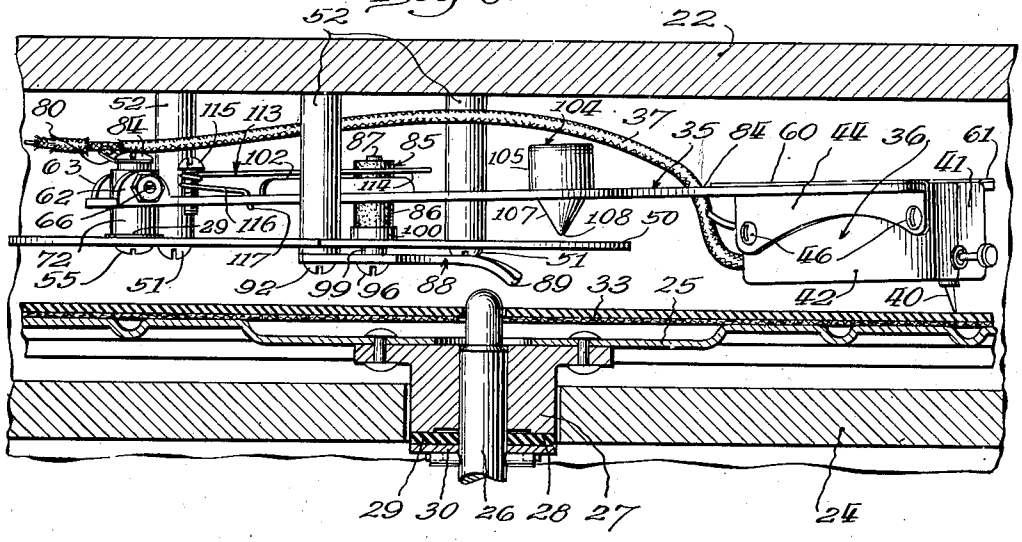


Fig. 7.

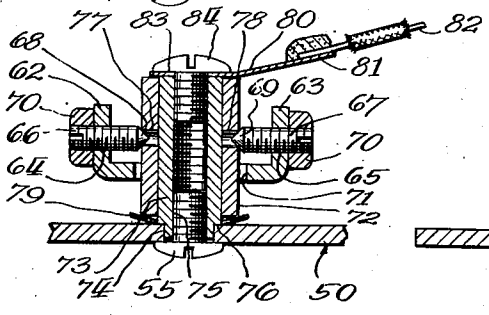


Fig. 8.

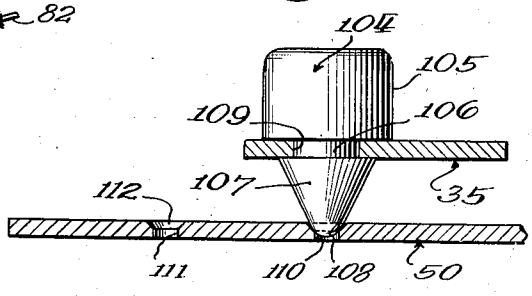
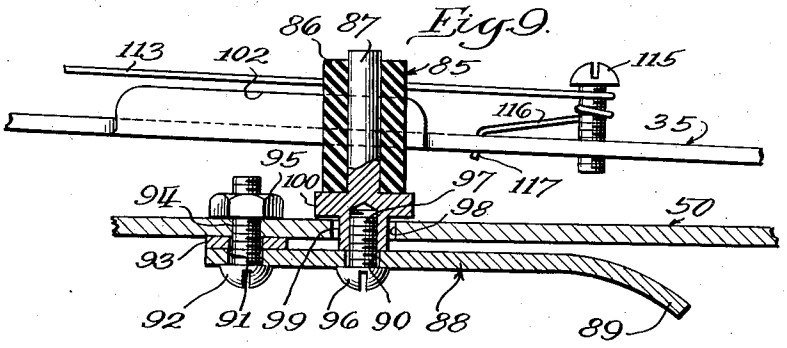


Fig. 9.



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UNITED STATES PATENT OFFICE

2,166,986

PHONOGRAPH

Roy Dally, Racine, Wis., assignor to Webster Electric Company, Racine, Wis., a corporation of Wisconsin

Application February 16, 1938, Serial No. 191,175

18 Claims. (Cl. 274—2)

The present invention relates to phonographs, and is particularly concerned with the provision of an improved phonograph which is adapted to be manipulated with greater ease, less motions, and with better effect than the devices of the prior art.

One of the objects of the invention is the provision of an improved phonograph which is semi-automatic in that the mere movement of the phonograph housing cover is adapted to actuate the tone arm and move it into proper position for the playing of a new record, thereby reducing the manual motions which are necessary in the playing of the phonograph and eliminating the handling of the phonograph.

Another object is the provision of an improved phonograph which is so constructed that when the cover of the phonograph housing is lifted the motor board or turntable is cleared automatically so that the records can be picked up readily.

Another object of the invention is the provision of an improved phonograph which is adapted to be handled by unskilled operators and which results in less damage to the records. It is particularly adapted to be used with ease by blind people.

Another object is the provision of an improved phonograph construction which may be manufactured more cheaply than the devices of the prior art and which may, therefore, be placed within the means of a larger number of the public so as to benefit potential users of the phonograph.

Another object of the invention is the provision of an improved phonograph construction in which it is easier to change the needle, as the pick-up is already supported in proper position for receiving the needle, and in which the tone arm is so arranged that it permits the tracking of the needle in a direction which is within three degrees of a tangent to the record groove throughout the range of the grooved portion of the record.

Another object of the invention is the provision of an improved phonograph construction which may be embodied in simpler constructions by omitting some of the refinements thereof as described therein, and some of the features of which also lend itself to use in automatic phonograph mechanisms by means of the pivotal support of the tone arm on a frame instead of a cover.

Another object is the provision of an improved phonograph tone arm mechanism in which the tone arm is automatically located for engagement with the starting groove of either a twelve inch or a ten inch record; or, if the record has no starting groove, it is automatically located in that portion of the grooved record just before the beginning of the music or other recording.

Another object is the provision of an improved phonograph tone arm mechanism adapted to locate the tone arm and place it on the record in proper position, the mechanism having means for adjustment for use with either of two different sizes of records.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the four sheets of drawings accompanying the specification,

Fig. 1 is a view in perspective of a phonograph constructed according to the present invention;

Fig. 2 is a full sized view of the tone arm of Fig. 1, with its supporting mechanism, the tone arm being shown in full line position, ready for playing of another record, and in dotted line position after it has just finished playing a record, the view being taken from the bottom of the cover of Fig. 1;

In Fig. 2 the mechanism is adjusted for a ten inch record.

Fig. 3 is a similar view, in which the tone arm is shown in the same two positions and the mechanism is adjusted for use on a twelve inch record;

Fig. 4 is a top plan view of the tone arm mechanism, taken on a plane parallel to the cover, and located just below the cover of the phonograph housing, with the mechanism adjusted for use on a ten inch record;

Fig. 5 is a similar view, with the mechanism adjusted for use on a twelve inch record;

Fig. 6 is a fragmentary full sized sectional view, taken on a vertical plane, passing through the axis of the turntable shaft and showing the tone arm mechanism in elevation;

Fig. 7 is a fragmentary sectional view, taken on the plane of the line 7—7 of Fig. 4, looking in the direction of the arrows, showing the details of construction of the pivotal arrangement for the tone arm;

Fig. 8 is a fragmentary vertical sectional view, taken on the plane of the line 8—8 of Fig. 4, looking in the direction of the arrows, and showing the arrangements for automatically locating the tone arm in proper position to register with

the grooved portion of a record which it should engage, just before the start of the recorded sound;

Fig. 9 is a fragmentary vertical sectional view, taken on the plane of the line 9—9 of Fig. 5, looking in the direction of the arrows, showing the mechanism for changing the adjustment of the tone arm for use with records of different size, such as ten inch or twelve inch;

Fig. 10 is a vertical sectional view, taken on the plane of the line 10—10 of Fig. 4, looking in the direction of the arrows, showing the mode of support of the crystal pick-up unit on the tone arm;

Fig. 11 is a wiring diagram for an electric phonograph embodying the invention; and

Fig. 12 is a fragmentary elevational view of the mechanism for holding the cover in elevated position.

Referring to Fig. 1, 20 indicates in its entirety the phonograph, which may be provided with a conventional box-like housing 21, having a cover member 22 pivotally mounted on hinges 23 and utilized to cover the record and tone arm while it is playing, to lessen the noise which results from the action of the needle on the record.

It is well known that it is desirable to close the cover of the phonograph after the record has been started and the tone arm has its needle properly placed, tracking in the groove of the record.

Referring to Fig. 6, the phonograph housing 21 preferably includes the partition 24 enclosing the driving motor, and the other mechanism which is located below the turntable 25. The turntable is mounted for rotation with the drive shaft, from which it may be removed by merely lifting the turntable from the shaft.

The driving surface between the turntable and the shaft 26 is provided by means of the hub 27, having a lower flat surface 28, which engages the resilient rubber washer 29 that is supported upon a circular plate 30, which is fixedly secured to the shaft 26.

It should be understood that the present invention is embodied in phonographs having spring-wound motors, as well as those having electric motors, but the invention is of particular importance when utilized in connection with an electric motor-driven phonograph which is adapted to be controlled by electric switches, and which is provided with suitable thermionic amplifying means or circuits for amplifying the electromotive forces which are generated by the pick-up unit, and the aperture shown at 32 in the partition 24 is for the reception of a suitable thermionic tube.

The switch actuating member seen at 31' and the switch 31 is for controlling the starting and stopping of the phonograph which is preferably provided with an alternating current motor, and the thermionic amplifying circuits are so arranged that they may be energized by the same 110 volt 60 cycle current supply as is used to drive the motor, both circuits being controlled from the same switch 31. As any thermionic amplifying circuit and any driving arrangement may be used with the present phonograph mechanism, these circuits and driving arrangements are not disclosed in detail, but are merely described in order to include in the description a complete operative device. The substitution of any of the known turntable driving arrangements and amplifying circuits may be made by those skilled in the art.

The turntable 25 has the usual cloth covering 33 and, as illustrated in Figs. 1 and 6, bears a ten inch record 34. The phonograph mechanism includes a tone arm, indicated in its entirety by the numeral 35, bearing a reproducer or crystal pick-up unit 36.

The turntable motor is started and the circuits of an amplifying phonograph energized simultaneously by means of the switch 31, which controls both the amplifying circuits and the phonographic motor, and starts the turntable rotating.

The pick-up unit is preferably of the type disclosed in my co-pending application, Serial No. 186,049, filed January 21, 1938, and it is connected by the insulated electrical conductors in the cable 37 with the circuit, as shown in the diagram Fig. 11.

It should be understood, however, that any type of reproducer or pick-up may be utilized, such as an electromagnetic pick-up or any of the reproducers of the prior art. The crystal pick-up described in my prior application is of particular importance in this connection because it is so small that it does not interfere with the other parts of the mechanism or supporting structure, and is of a minimum weight and adapted to be mounted for substantially tangential tracking on the structure to be described.

This pick-up unit is illustrated in section in Fig. 10, and it comprises the complementary half housing members 38, 39 of soft resilient and flexible rubber which enclose and secure the crystal of Rochelle salts, and also mount the chuck, which is connected to the crystal in such manner as to permit its torsional movement responsive to the actuation by the needle 40.

The complete disclosure of the crystal pick-up unit of my prior application is hereby incorporated by reference thereto.

As shown in Fig. 10, the rubber halves of the housing are shielded and enclosed in the magnetic metal outer housing of electromagnetic metal 41, 42, the parts of which are secured together by a suitable tubular rivet 43. This makes a crystal unit, having plane rectangular sides, which fits between the downwardly extending flanges 44, 45 on the tone arm and may be secured in place by a bolt 46, having a threaded bore and a screw bolt 47 threaded into it, the bolts passing through registering apertures in the flanges 44, 45, and the crystal unit, and the heads engaging the flanges.

Two sets of such bolts, as shown in Fig. 6, firmly secure the crystal unit against rotation, with its needle projecting downward and backward in proper position to engage the record 33.

The tone arm assembly is preferably mounted on the cover 22, but in some embodiments of the invention the supporting member 22 may not necessarily consist of a cover, but it may consist of a separate pivotal frame which is connected to the cover by linkage.

When the tone arm assembly is secured to the cover, it is adapted to be automatically lifted from the record by the lifting of the cover, and placed back on the record by the closing of the cover.

As the acts of lifting and closing the cover are manual acts, which are usually necessary and incident to the operation of the phonograph, it is of great advantage to utilize these acts for performing the other operations of lifting the tone arm and putting the tone arm back in proper position. This reduces the number of manual operations necessary to the operation of the phonograph, permits the operator to change records or replay a record very quickly, and makes the phonograph particularly adaptable for use by blind persons, as they do not have to feel for the tone arm and manipulate it, nor do they have to

feel around to place the tone arm back in proper position.

In the preferred embodiment of the invention, the cover 22 carries a supporting plate 50, which is secured thereto by a plurality of wood screws 51, which pass through apertures in the supporting plate 50 and through the spacing sleeves 52, which may consist of insulating material, such as fiber or other suitable material.

The plate 50 is clamped between the end of the sleeves 52 and the heads of the wooden screws 51, in spaced relation to the lower side of the cover 22 and in proper position to hold the tone arm and other parts. The plate 50 is bounded by a flat edge 53 at the rear side of the phonograph because that edge is adjacent the rear wall of the cover, and it is desirable to locate the tone arm in that position.

The right edge 54 in Fig. 1 is curved along the line of a circle, the center of which is located at the point or screw 55, which is the point of pivotal support of the tone arm 35, because the curved edge 54 is then provided with sufficient clearance with respect to the pick-up unit 36, so that it can pivot freely about the axis 55, without hitting the plate 50. The other edge 56 is given a curve similar to 54, in order to make the plate symmetrical, and thus the same plate might be used for left hand or right hand tone arm arrangements, although the arrangement shown with the tone arm at the right in Fig. 1 is the only one used, due to the usual direction of rotation of the turntable 25, which is in a clockwise direction.

The tone arm 35 comprises a sheet metal member, which may be formed by stamping and welding operations, and the shape of the arm 35 is illustrated in Figs. 2 and 3. The arm has a straight portion 57 extending from its vertical axis at the screw 55, an elbow 58, and another straight portion 59 extending from the elbow to the pick-up unit 36. This curved form of tone arm permits the location of the vertically extending axis for the tone arm in such manner that there is substantially tangential tracking of the needle in the groove of the record 34 between the inner and outer grooves of the groove elements of the record.

Tangential tracking can be achieved within about three degrees over the full range of the record, and of course at one point on the record there is perfect tangential tracking. By tangential tracking I mean that the projection of the axis of the needle on the plane of the record will produce a line which is tangential to the circle of a groove on the record. This projection of the axis of the needle will produce a line because the needle is disposed at an angle with its end extending backward with respect to the direction of its drag on the record.

Referring to Fig. 6, it will be observed that the depending flanges 44, 45 on the tone arm 35 are carried by horizontal flanges 60, 61. These angle members 44, 60, and 45, 61 may be secured to the flat metal plate, which comprises the body of the tone arm 35, by spot welding the flanges 60, 61 to the tone arm plate 35. The opposite end of the tone arm has a pair of upwardly turned pivoted supporting flanges 62, 63, which are provided with threaded bores 64, 65 for receiving the slotted screw bolts 66, 67.

These screw bolts are provided with conical pointed ends 68, 69, and are adapted to serve as the horizontal pivot for the tone arm. The flanges 62, 63 are resilient, and the screw bolts 66, 67 are secured in place when threaded into the bores 64, 65 by lock nuts 70. The tone arm has an enlarged aperture 71 located in its body, surrounding the pivoted post 72, and having such a clearance with the post that the pivotal movement of the tone arm on the horizontal axis defined by the axis of the screws 66, 67 is permitted.

The screw bolt 55, previously referred to, is used to support a tubular bearing member 73, which is provided with a reduced cylindrical end 74 and with a threaded bore 75. The screw 55 is threaded into the bore 75 and clamps the annular shoulder 76 against the upper side of the plate 50 in Fig. 7, thus fixedly securing the tubular bearing member 73 to the plate 50 with its axis at right angles thereto. The pivoted post 72 comprises another sleeve, which is slidably and rotatably mounted on the bearing member 73, and is provided with a pair of aligned apertures 77, 78 located on a diameter of the sleeve 72 and of such size that the outer edges of the apertures 77, 78 engage the frusto-conical surfaces 68, 69 at the end of the screws 66, 67.

A spring washer 79 takes up the play between the end of the sleeve 72, thrust bearings provided by the plate 50, and a sheet metal connector 80.

The sheet metal connector 80 may comprise a steel strip having an eye 81 at one end to facilitate the attachment of the wire 82, and having a lock washer 83 formed at the other end and secured in place by screw bolt 84 threaded into the bore 75. Thus the tone arm is adapted to pivot on an axis which is vertical when the cover is down, by virtue of the sliding movement on sleeve 72 on bearing 73, and it may pivot on a horizontal axis, by virtue of the movement of the conical ends of screws 66, 67 in apertures 77, 78.

The spring washer 79 forces the sleeve 72 up against the lower surface of the lock washer connector 80. The conductor cable 33 from the pick-up unit 36 passes through an aperture at 84 in the tone arm 35 so that it may be supported for pivotal movement with the tone arm.

In order that the tone arm may have its crystal unit and needle 36 properly located to begin playing on either a ten inch or a twelve inch record, I prefer to provide the tone arm with an adjustable stop member, indicated in its entirety by the numeral 85 (Fig. 9). This stop member comprises a soft rubber tube or sleeve 86, which is mounted on a pin 87, extending at right angles to the supporting plate 50 (Fig. 9), but which is actually movably mounted on the plate 50 by means of a hand lever 88.

The hand lever 88 comprises a sheet metal member, having an outwardly turned end 89 for engagement with the fingers and having a pair of apertures 90, 91. The aperture 91 is used to support the lever 88 for pivotal movement on a screw bolt 92, which also passes through a washer 93 and is threaded into a bore 94 and secured therein by lock nut 95.

The aperture 90 is used to receive the screw bolt 96, which is threaded into a threaded bore 97 in the pin 87 in such manner that the end of the pin 87 is clamped tightly against the lever 88 and fixedly secured thereto.

Referring to Fig. 1, it will be observed that the plate 50 is provided with an arcuate slot 98, and when the lever 88 rotates on the axis provided by the screw 92, the lower part of the pin 87, that is, the cylindrical portion 99, moves in the arcuate slot 98. The pin 86 also has outwardly projecting annular flange 100, which is adapted to engage the end of the rubber sleeve 86 and to act as a thrust bearing, slidably engaging the lower

surface of plate 50, thus reinforcing the pin 87 and lever 88 against the lateral thrust which is applied to the rubber sleeve 86.

The pivot screw 92 is so located and the proportions of the parts of the lever 88 and stop 85 are such that when the stop 85 is at one end of the arcuate slot 98, it is located to stop the tone arm in position to engage the beginning of a ten inch record, and when the stop 85 is at the other end of the arcuate slot 98 it is located to stop the tone arm in position to engage a twelve inch record at the starting groove.

The right hand position of the lever 88, as shown in Fig. 1, is the position for a ten inch record, and the left hand position, or that shown in Fig. 3, for the lever 88, is the position for a twelve inch record. Ten inch and twelve inch records are most frequently used for phonographs of this type, but I desire it to be understood that the present movable stop arrangement may be constructed to be used with any size of record, and it may have intermediate or other positions in which to hold the tone arm for a plurality of records of different sizes.

The lever 88 is retained in its proper position by gravity, since, as shown in Fig. 2, the weight of the lever tends to keep it at one end or the other of the arcuate slot 98.

The operation of the structure so far disclosed may now be explained in a general way. When a record is placed upon the turntable 25, as shown in Fig. 1, the cover must necessarily be lifted, and the tone arm falls by gravity to the position of Fig. 1, from which I shall start to describe its operation.

The tone arm has an upwardly turned flange 102 for engaging the stop member 85, and the stop member 85 is in proper position for the type of record which the operator desires to play, that is, in the twelve inch position for a twelve inch record, or in the ten inch position for a ten inch record, as shown by the indicia on the bottom side of the plate (Fig. 1).

The record need then only be placed on the turntable and the cover-supporting lever 103 released so that the cover may be permitted to drop. When the cover is dropped, the tone arm 35 pivots on the screws 66, 67 toward the plate 50 until the point 108 of the rubber stop member drops into the socket 110. The tone arm can then not swing backward or get out of its proper position for engaging the record. The needle then engages the smooth portion of the record, where there are no grooves, adjacent the periphery of the record, and there is a minimum amount of friction between the smooth part of the record and the needle.

As the cover goes downward, the tone arm, which is supported by a suitable stop member against the plate 50, moves with it, being constantly held in the position of Fig. 1, until the needle engages the record, which is at a point just before the cover engages the box 21. As the cover goes down to engage the top of the box 21, the engagement of the needle with the record lifts the tone arm from engagement with the plate 50 so that the tone arm is then freely supported for pivotal movement on a horizontal axis and a vertical axis in position to play, with the needle engaging the record.

In some embodiments of the invention the records may be provided with a starting groove, into which the needle naturally tracks, irrespective of its position at the edge of the record, within a certain range; that is, the needle does not have to be located then at an accurate distance from the edge of the record because the starting groove carries it into the beginning of the recording.

Assuming that such a record is used, then the phonograph will play until it reaches the end of the record, when the cessation of the reproduction of the sound, such as music or conversation, will indicate to the user that the record has been finished, or the phonograph may be provided with a suitable stop mechanism at the end of the record for turning off the motor. In either event, the tone arm will then have reached the dotted line position of Fig. 2 or Fig. 3, which shows the tone arm as seen from the bottom of the cover, with the cover down. It is only necessary then to lift the cover, and as the cover is lifted the tone arm, which is previously in a horizontal position with respect to the record, moves upward with the cover, and the free end of the tone arm tends to drop, the opposite end being pivotally supported at 55, so that it cannot drop. The tone arm then drops by gravity from the position shown in dotted lines in Fig. 2 to the position shown in full lines; that is, the position shown in Fig. 1, simultaneously with the lifting of the cover.

It will be observed that the mere lifting of the cover automatically moves the tone arm from the position which it has at the completion of the record to the proper position for beginning a new record. The lowering of the cover automatically places the tone arm on the record, and it is only necessary, therefore, to energize the phonograph or start the turntable, place a record on it, and lower the cover.

When it is desired to replay a record, it is only necessary to lift the cover until the tone arm drops, and lower the cover again; and for this purpose the cover need not be lifted until the supporting lever 103 catches, but need only be lifted part way. It is virtually unnecessary to do anything more than to lift the cover, change records, and lower the cover when the turntable is already rotating. All of the other manual operations incident to the actuation of phonographs of the prior art are eliminated.

Where records are not provided with starting grooves, and where it is desired to locate more accurately the needle with respect to the grooves which represent the beginning of reproduction on the record, it is desirable to provide more accurate means for locating the tone arm at the beginning of the record.

In the preferred embodiment of the invention, the tone arm is provided with a supporting and aligning member, which may comprise a soft, resilient and flexible rubber member 104, shown in Fig. 8. The member 104 is made of resilient rubber and has a cylindrical upper portion 105, a reduced cylindrical portion 106, a head 107, which is substantially conical in shape, and provided with a rounded point 108. The member 104 is secured to the tone arm in an aperture 109 by having its head 107 compressed as it is forced through the aperture, so that the point 108 is disposed on the lower side of the tone arm. The point 108 then comprises the supporting arrangement for the tone arm, which supports the tone arm against the plate 50, while the cover is being lowered, and until the needle hits the record.

The plate 50 is provided with an aperture or socket 110 for each size of record, the aperture 110 in Fig. 8 being for the twelve inch record, and the aperture 111 being for the ten inch record. These apertures have tapered or frusto-

conical or countersunk upper portions 112, which facilitate the guiding of the point 108 into the socket 110, 111, and the apertures 110, 111 are located so that the needle will be deposited on the smooth and ungrooved part of the record.

The tone arm is also preferably provided with a spring 113, which may be made of resilient steel wire, and which has a relatively long projecting arm 114 for engaging the stop member 85. The arm 114 has a relatively backward curve so that its curved portion engages the stop member 85, whether the stop member is at one or the other of its positions in the arcuate slot 93.

The spring member 113 extends longitudinally of the straight portion 57 of the tone arm to screw 115, which is threaded into a threaded bore in the tone arm.

The spring is wound once around the screw 115, and then extends backward by means of the portion 116, and it has a downwardly turned end 117, which is secured in an aperture 118 in the tone arm. The initial shape of the spring is such that it tends to move the tone arm away from the stop member 85, but the spring is not strong enough to support the weight of the tone arm, and when the tone arm drops down to the position of Fig. 1, the spring 113 is compressed and the tone arm actually engages the stop member 85.

In this improved and preferred form of the invention, including the refined structure for locating the needle, the operation previously described is modified as follows: When the cover is up, as shown in Fig. 1, the tone arm engages the stop member 85, which stop member is located for the record size to be played. The record is then placed on the turntable and the turntable started rotating by energizing the motor with switch 31.

The engagement between the needle and the record takes place, as previously described, just before the cover reaches its final downward position. At the time of the engagement of the needle with the smooth edge of the record, the tone arm has also moved toward the plate 50 and is supported by the member 104 by means of its point 108 in the socket 110.

As the cover moves down to its final position, the tone arm, being supported by its needle on the smooth part of the record, the stop member 104 has its point 108 lifted from the socket 110. The tone arm is now free to move in a horizontal plane because the point of the member 104 is out of its socket 110, and the only thing holding the tone arm is the friction between the needle and the smooth part of the record.

There being but little friction between the smooth portion of the record and the needle, and this friction being diminished also by the rotation of a record, the spring 113 reacting against the stop member 85, moves the tone arm downward from the position of Fig. 4 or 5, that is, the needle moves laterally from the smooth part of the record into the groove.

The motion of the tone arm under the influence of spring 114 continues until the needle engages the first groove adjacent the periphery of the record. Thus the present device is adapted to apply the tone arm to the record in the best way. No matter how forcibly the cover is lowered or dropped, the needle does not hit the reproducing part of the record, but is first placed on the smooth part of the record and gently moved over into the first groove.

Referring again to the cover-supporting lever 103, the one shown happens to be the type which drops into a groove in its guide to hold the cover up, as shown in Fig. 12, but any type of cover-supporting lever or counter-balanced cover or spring-supported cover may be used.

It will thus be observed that I have invented an improved phonograph which is of particular advantage when used by the blind. It is only necessary to lift the cover and change the record and put the cover down again while the turntable motor is still energized, to effect the playing of a new record. If it is desired to play a record over again, it is only necessary to lift the cover part way until the tone arm drops over into its proper initial position and to again lower the cover.

The number of manual operations in the operation of the phonograph is thus greatly reduced. This is greatly appreciated by users who may be using the phonograph to play dance music and who may wish to proceed from one record to another, or replay a record with a minimum amount of delay. The present construction is simple and may be manufactured at a low cost, and operates with less damage to phonograph records than the devices of the prior art.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a phonograph, the combination of a support with a turntable adapted to support a record, a cover for the turntable, a tone arm pivotally mounted on said cover whereby the tone arm is moved into engagement with the record when the cover is lowered above the turntable, and stop means carried by said cover for locating said tone arm in predetermined position with respect to a record, said tone arm having its point of pivotal mounting so located on the cover that its free end is moved laterally by the playing of the record to a position which is elevated with respect to the record-beginning position on the cover after the cover has been lifted, so that the tone arm moves by gravity from the record-finishing position to the record-beginning position when the cover is lifted.

2. In a phonograph, the combination of a support with a turntable adapted to support a record, a cover for the turntable, a tone arm pivotally mounted on said cover whereby the tone arm is moved into engagement with the record when the cover is lowered above the turntable, said tone arm being moved laterally by the playing of the record and having its point of pivotal mounting on said cover so arranged that it drops by gravity from record-finishing position to record-beginning position, when the cover is lifted and stop means carried by said cover for locating said tone arm in predetermined position with respect to a record, said stop means being movable into two different positions for the purpose of locating the tone arm to play on records of different size.

3. In a phonograph, the combination of a support with a turntable, a member pivotally mounted above said turntable and adapted to support a tone arm, said tone arm being provided with a pick-up, said tone arm being mounted for pivotal movement on an axis which is transverse to the

plane of a record carried by said turntable when said pivotal member is disposed adjacent the turntable, and having its point of pivotal mounting on the cover so located that when the cover is in lifted position the record-finishing position of the tone arm is above the record-beginning position whereby the tone arm may be lifted by lifting said member from the turntable, said tone arm being adapted to move from record-finishing position to record-starting position when said member is moved upward from the turntable, and stop means for locating the tone arm in predetermined position for the beginning of the record.

4. In a phonograph, the combination of a support with a turntable, a member pivotally mounted above said turntable and adapted to support a tone arm, said tone arm being provided with a pick-up, said tone arm being mounted for pivotal movement on an axis which is transverse to the plane of a record carried by said turntable when said pivotal member is disposed adjacent the turntable, and having its point of pivotal mounting on the cover so located that when the cover is in lifted position the record-finishing position of the tone arm is above the record-beginning position whereby the tone arm may be lifted by lifting said member from the turntable, said tone arm being adapted to move from record-finishing position to record-starting position when said member is moved upward from the turntable, and stop means for locating the tone arm in predetermined position for the beginning of the record, said stop means being movable into either of two positions whereby the tone arm may be suitably located for records of different width.

5. In a phonograph, the combination of a support with a turntable and a cover pivotally mounted above said turntable, a tone arm carried by said cover and movably mounted thereon for substantially universal movement, said tone arm having a pick-up, and having its free end and point of pivotal mounting so located that when the cover is in lifted position the tone arm tends to drop toward record-beginning position and means for limiting the movement of the tone arm in a direction toward or away from said cover, whereby the tone arm is adapted to be lifted with the cover and moved from the record-finishing position to the record-beginning position when the cover is lifted.

6. In a phonograph, the combination of a support with a turntable and a cover movably mounted above said turntable, a tone arm carried by said cover and pivotally mounted thereon for substantially universal movement, said tone arm having a pick-up and means for limiting the movement of the tone arm in a direction toward or away from said cover, said tone arm having its point of pivotal mounting on said cover and its free end extending in such a direction that the free end tends to drop by gravity to record-beginning position whereby the tone arm is adapted to be lifted with the cover and moved by gravity from the record-finishing position to the record-beginning position, when the cover is lifted, and stop means for limiting the movement of said tone arm by gravity and locating the tone arm in predetermined position for engaging the record.

7. In a phonograph, the combination of a support with a turntable and a cover movably mounted above said turntable, a tone arm carried by said cover and pivotally mounted thereon for substantially universal movement, said tone arm having a pick-up, said tone arm having its point of pivotal mounting on said cover and its free end extending in such a direction that the free end tends to drop by gravity to record-beginning position and means for limiting the movement of the tone arm in a direction toward or away from said cover, whereby the tone arm is adapted to be lifted with the cover and moved by gravity from the record-finishing position to the record-beginning position, when the cover is lifted, and stop means for limiting the movement of said tone arm by gravity and locating the tone arm in predetermined position for engaging the record, said latter stop means being located to place the needle on the smooth part of the record adjacent the periphery of the record.

8. In a phonograph, the combination of a support with a turntable and a cover movably mounted above said turntable, a tone arm carried by said cover and pivotally mounted thereon for substantially universal movement, said tone arm having a pick-up, said tone arm having its point of pivotal mounting on said cover and its free end extending in such a direction that the free end tends to drop by gravity to record-beginning position and means for limiting the movement of the tone arm in a direction toward or away from said cover, whereby the tone arm is adapted to be lifted with the cover and moved by gravity from the record-finishing position to the record-beginning position, when the cover is lifted, and stop means for limiting the movement of said tone arm by gravity and locating the tone arm in predetermined position for engaging the record, said latter stop means being located to place the needle on the smooth part of the record adjacent the periphery of the record, and resilient means for moving the tone arm laterally into engagement with the first recording groove when the cover is moved down above the turntable.

9. In a phonograph, the combination of a support with a turntable and a cover movably mounted above said turntable, a tone arm carried by said cover and pivotally mounted thereon for substantially universal movement, said tone arm having a pick-up, said tone arm having its point of pivotal mounting on said cover and its free end extending in such a direction that the free end tends to drop by gravity to record-beginning position and means for limiting the movement of the tone arm in a direction toward or away from said cover, whereby the tone arm is adapted to be lifted with the cover and moved by gravity from the record-finishing position to the record-beginning position, when the cover is lifted, and stop means for limiting the motion of the tone arm toward or from the cover being so located that when the cover is down in its final position the tone arm is lifted from one of its stop members by the engagement of the needle with the record.

10. In a phonograph, the combination of a support with a turntable and a cover movably mounted above said turntable, a tone arm carried by said cover and pivotally mounted thereon for substantially universal movement, said tone arm having a pick-up, said tone arm having its point of pivotal mounting on said cover and its free end extending in such a direction that the free end tends to drop by gravity to record-beginning position, means for limiting the movement of the tone arm in a direction toward or away from said cover, whereby the tone arm is adapted to be lifted with the cover and moved by gravity from the record-finishing position to

the record-beginning position, when the cover is lifted, and stop means for limiting the motion of the tone arm toward or from the cover being so located that when the cover is down in its final position the tone arm is lifted from one of its stop means by the engagement of the needle with the record, and an aligning member carried by the tone arm, and engaging means carried by the cover and adapted to be rendered ineffective when the needle engages the record.

11. In a phonograph, the combination of a support carrying a turntable, a frame member pivotally mounted above said turntable on said support, a tone arm, said tone arm being mounted on said frame member for substantially universal movement, said tone arm having its free end provided with a pickup, said frame member having stop means for limiting the lateral pivotal movement of said tone arm on said frame member and stopping said tone arm in substantially the position for beginning of a record, said stop means and said universal mounting of said tone arm being so located with respect to the pivotal mounting of said frame that the free end of said tone arm is adapted to drop by gravity from the record-finishing position to the record-beginning position when the frame member is moved upward on its pivotal support.

12. In a phonograph, the combination of a support carrying a turntable, a frame member pivotally mounted above said turntable on said support, a tone arm, said tone arm being mounted on said frame member for substantially universal movement, said tone arm having its free end provided with a pickup, said frame member having stop means for limiting the lateral pivotal movement of said tone arm on said frame member and stopping said tone arm in substantially the position for beginning of a record, said stop means and said universal mounting of said tone arm being so located with respect to the pivotal mounting of said frame that the free end of said tone arm is adapted to drop by gravity from the record-finishing position to the record-beginning position when the frame member is moved upward on its pivotal support, said stop means being adjustably mounted for quick change of adjustment from the record-beginning position of a small record to that of a larger record, or vice versa.

13. A tone arm assembly for attachment to existing phonographs, comprising a supporting plate provided with a plurality of attachment posts adapted to be attached to a cover or the like, said posts having means for spacing said plate from a cover or the like, a tone arm pivotally mounted on said plate within the space embraced by said spacing means and plate for movement in a plane substantially parallel to that of the plate and for movement toward and from said plate.

14. A tone arm assembly for attachment to existing phonographs, comprising a supporting plate provided with a plurality of attachment posts adapted to be attached to a cover or the like, said posts having means for spacing said plate from a cover or the like, a tone arm pivotally mounted on said plate within the space embraced by said spacing means and plate for movement in a plane substantially parallel to that of the plate and for movement toward and from said plate, said tone arm being formed with an obtuse angle intermediate its length, whereby a pickup may be mounted for substantially tangential tracking.

15. A tone arm assembly for attachment to existing phonographs, comprising a supporting plate provided with a plurality of attachment posts adapted to be attached to a cover or the like, said posts having means for spacing said plate from a cover or the like, a tone arm pivotally mounted on said plate within the space embraced by said spacing means and plate for movement in a plane substantially parallel to that of the plate and for movement toward and from said plate, and stop means carried by said plate for stopping pivotal motion of said tone arm in a plane substantially parallel to said plate and locating said tone arm in predetermined record-beginning position.

16. A tone arm assembly for attachment to existing phonographs, comprising a supporting plate provided with a plurality of attachment posts adapted to be attached to a cover or the like, said posts having means for spacing said plate from a cover or the like, a tone arm pivotally mounted on said plate within the space embraced by said spacing means and plate for movement in a plane substantially parallel to that of the plate and for movement toward and from said plate and stop means carried by said plate for stopping pivotal motion of said tone arm in a plane substantially parallel to said plate and locating said tone arm in predetermined record-beginning position, said stop means being movably mounted for a pair of predetermined positions whereby the tone arm may be quickly adjusted for use on smaller and larger records of predetermined size.

17. A tone arm assembly for attachment to existing phonographs, comprising a supporting plate provided with a plurality of attachment posts adapted to be attached to a cover or the like, said posts having means for spacing said plate from a cover or the like, a tone arm pivotally mounted on said plate within the space embraced by said spacing means and plate for movement in a plane substantially parallel to that of the plate and for movement toward and from said plate, and stop means carried by said plate for stopping pivotal motion of said tone arm in a plane substantially parallel to said plate and locating said tone arm in predetermined record-beginning position, and resilient means carried by said assembly and acting between said stop means and said tone arm, said resilient means being of predetermined strength whereby it does not prevent the movement of said tone arm into engagement with said stop means by gravity, but when the tone arm is in engagement with the smooth part of a record, said resilient means, acting between said stop means and tone arm, moves the tone arm into groove-engaging position.

18. A tone arm assembly for attachment to existing phonographs, comprising a supporting plate provided with a plurality of attachment posts adapted to be attached to a cover or the like, said posts having means for spacing said plate from a cover or the like, a tone arm pivotally mounted on said plate within the space embraced by said spacing means and plate for movement in a plane substantially parallel to that of the plate and for movement toward and from said plate, and stop means carried by said plate for stopping pivotal motion of said tone arm in a plane substantially parallel to said plate and locating said tone arm in predetermined record-beginning position, said predetermined record-beginning position being on the smooth part of the record before engagement with the first groove, to prevent damage to records, and means for moving the tone arm over into the first groove when the turntable is started.

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