

Jan. 30, 1951

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2,539,784

MAGNETIC PICKUP ARM BIASING DEVICE

Filed May 20, 1944

2 Sheets-Sheet 1

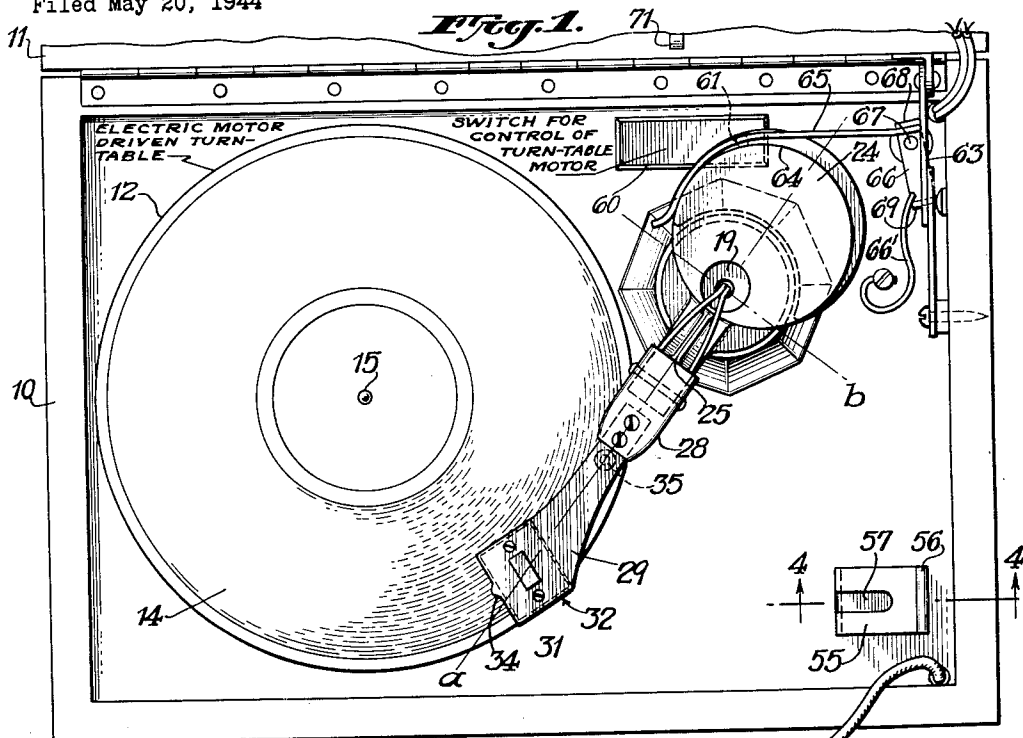


Fig. 4.

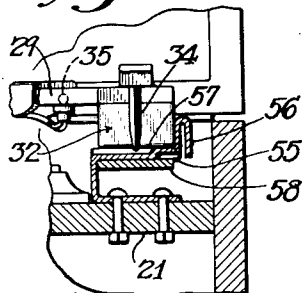
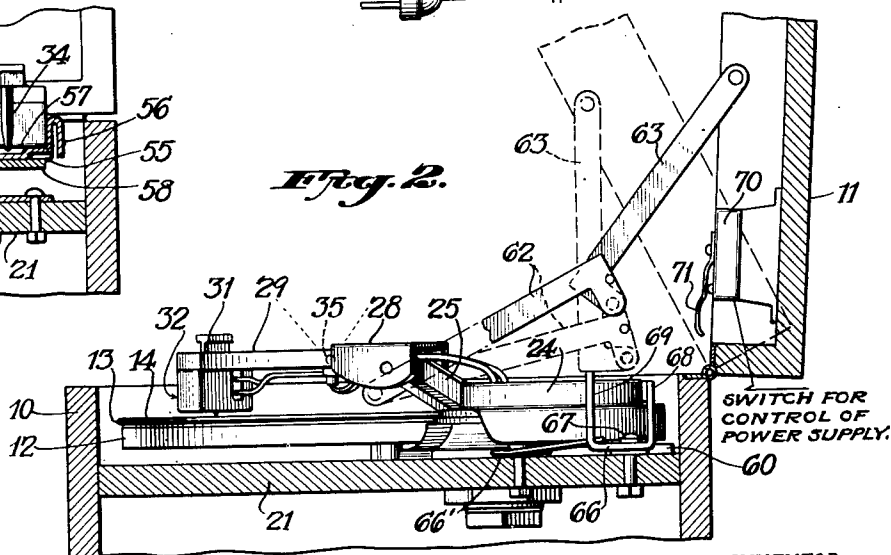


Fig. 2.



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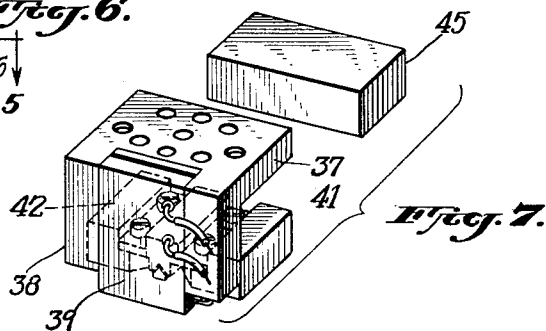
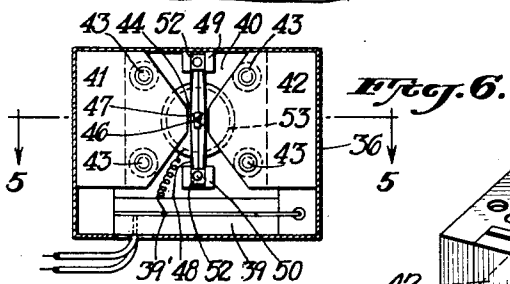
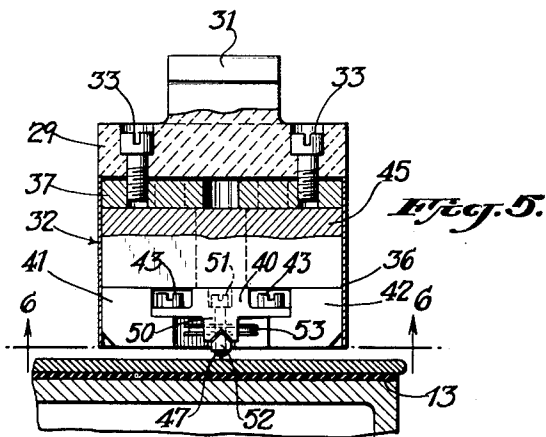
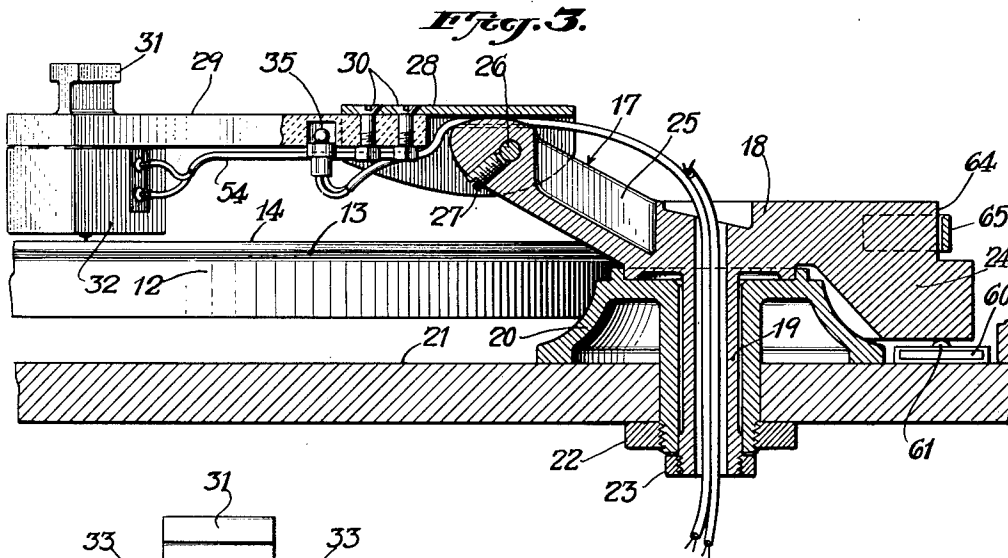
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UNITED STATES PATENT OFFICE

2,539,784

MAGNETIC PICKUP ARM BIASING DEVICE

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Application May 20, 1944, Serial No. 536,454

7 Claims. (Cl. 274—1)

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This invention relates to improved phonographs, certain features thereof being such as to particularly adapt the construction for use by the blind. The construction is also well adapted for portable use by members of the public generally while traveling on boats, ships or vehicles, without danger that the sound records or the mechanism will become injured or inoperative due to the motions of the conveyance. The construction, furthermore, includes various features making possible improved sound reproduction when using inexpensive or worn records, and records of such inferior quality or having such fine grooving that same are not capable of being played on phonographs heretofore generally available. The invention also involves certain features for insuring proper operation of the mechanism by careless or unskilled persons, without danger of injury of the parts.

According to one important phase of the invention, the stylus-carrying assembly is arranged to include a magnet, either a strong permanent magnet or an electromagnet of adjustable strength, arranged with its pole or poles so positioned as to apply attractive force during the playing of the record, in a direction tending to hold the needle or stylus down in position in the sound track. For example, if the magnet is at or adjacent the sound-translating device, or forms a part of a magnetic "pick-up," then the magnet poles are positioned so as to be in fairly closely spaced relation to the turntable, the latter being formed of a suitable magnetic metal such as steel. Thus, as the sound-translating device moves across the record, succeeding portions of the turntable form a substantial part of the magnetic circuit of the magnet and the consequent attractive force causes the stylus in effect to cling in the sound track to a surprisingly effective degree, even though the machine may be tilted to a high angle or even though the sound track may be so fine, seriously worn or poorly made that the record could not be played at all with the usual phonograph. At the same time the magnetic attractive force is such that, particularly with records which are old or poorly made, the quality of the sound reproduction is improved as compared with what could otherwise be accomplished, in that noises and sounds due to extraneous vibrations, etc., are minimized. If desired, the magnet which is fixed on the stylus-carrying assembly may be in a position to apply attractive force during the playing of the record, to a magnetic element other than the record carrier, for example a bar of iron fixed to the

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casing and extending along the path of travel of the magnet. Such magnet may be an electromagnet, adjustable if desired, by varying its current or position.

Various further and more specific objects, features and advantages of the invention will appear from the description given below taken in connection with the accompanying drawings illustrating by way of example a preferred form of the invention. The invention consists in such novel features and combinations as may be shown and described in connection with the apparatus herein disclosed.

In the drawings:

Fig. 1 is a plan view showing various features of a preferred form of the invention;

Fig. 2 is a side elevational view of the same, the casing parts being shown in section.

Fig. 3 is an elevational view of the tone arm, portions adjacent the axis thereof being shown in section;

Fig. 4 is an enlarged vertical sectional view taken substantially along the line 4—4 of Fig. 1 with the "pick-up" device resting in inactive position;

Fig. 5 is a vertical sectional view taken transversely across approximately the middle portion of the "pick-up" device assembly substantially along line 5—5 of Fig. 6;

Fig. 6 is a sectional view taken substantially along line 6—6 of Fig. 5; and

Fig. 7 is a perspective view showing portions of the "pick-up" device in separated condition.

Referring to Fig. 1, the phonograph as here shown is adapted to be contained in a cabinet as at 10, which may also contain suitable vacuum tube amplifying equipment if desired. The cabinet may be provided with a hinged cover 11, which may contain if desired an electrically actuated loud speaker (not shown).

A turntable 12 may be provided and driven in the usual way, as by an electric motor or spring motor. The turntable is preferably formed as a disc of steel or other suitable ferromagnetic metal over which a mat of soft rubber 13 may be secured as by a suitable adhesive. Records as at 14 of the various known disc types are adapted to be carried upon this rubber mat and held in place by the usual center pin 15.

As best shown in Fig. 3, the stylus-carrying arm assembly 17 may comprise a cast metal body member 18 formed integrally with a shaft 19 for pivotal mounting of same to turn about a vertical axis to permit the stylus to travel across the record being played and permitting the arm as-

sembly to be placed alongside the record when inactive. The shaft 19 may be carried in a bearing member 20 fixed to a base 21 within the cabinet so that the bearing portion extends down through the base and may be secured as by a nut 22. The shaft portion 19 at its lower end may also be removably secured as by a nut 23. One side of the member 18 may be formed to include an integral counterweight portion 24 diametrically opposite an arm portion 25. Within the outer end of the arm 25 a pin 26 is fixed in position as by a set screw 27. This pin forms a horizontal pivotal supporting axis for the "pick-up" assembly which may include an inverted channel-shaped metal piece 28 pivoted on shaft 26, and removably secured to an arm member 29 as by screws 30. The arm member 29 may be formed of highly transparent insulation material such as a methyl methacrylate product, and may be provided at the upper side of its outer end with a finger piece portion 31 of the same material. A magnetic "pick-up" type of sound-translating device is indicated at 32 secured to the under side of the outer portion of arm 29 as by screws 33 (Fig. 5). As shown in Fig. 4, the outer end of arm 29 may be formed with an internally depending pointer portion 34 which is also transparent. A small electric lamp as at 35 (Figs. 1, 3) may be mounted within any desired portion of the arm 29 so as to direct light along this arm to illuminate same, as well as illuminating the finger piece 31 or indicating its outline, and also internally illuminating the pointer piece 34. The pointer piece will thus serve as a guide to the operator for indicating the location at which the pick-up device should be placed in order to have the stylus which is concealed on its under side, properly enter the initial portions of the sound track on the record. This means of illuminating the arm, finger piece and pointer, enables people who may be nearly blind to more readily operate the machine, and also greatly facilitates operation of the machine by anyone not blind, in the dark or under conditions of poor illumination, without the necessity of flooding the machine as a whole with bright light.

As shown in Figs. 5-7, the pick-up device may be contained within a small housing of non-magnetic sheet material as at 36, and may include an angular frame piece of non-magnetic metal 37, in an upper plate-like portion in which the screws 33 are secured. As shown in Fig. 7, the member 37 has a depending portion 38 within the back side of which a cavity may be formed for receiving a suitable shunt resistance device 39 for the pick-up coil, hereinafter referred to. That is, the device 39 may comprise layers of insulation between which a suitable resistance element 39' may be clamped (Fig. 6). As shown in Figs. 5 and 6, the lower part of member 37 may comprise a forwardly extending integral bracket portion 40 to which a pair of magnet pole pieces 41, 42 may be secured as by screws 43.

The pole pieces 41, 42 as best shown in the under side view thereof in Fig. 6, may be formed with tapered portions directed toward each other to concentrate the flux at a narrow gap 44. A magnetized bar of highly magnetic metal 45 may be slidably and removably received with its under surface resting upon the upper surfaces of pole pieces 41, 42, the upper surface of the bar contacting the under surface of the upper plate-like portion of the member 37.

The stylus or needle may take the form of a sapphire 46 fixed to protrude down from the lower

edge of a small armature member 47 formed of metallic metal. This armature member may for example comprise a tiny rectangular piece of sheet metal mounted in a vertical plane and the lower edges of which is slotted centrally to receive the sapphire and the upper edge of which is soldered to a phosphor bronze strip 48. This strip may have an inverted V-shaped cross section and has its ends secured to posts as at 49, 50 which depend integrally from bracket portion 40. The member 48 for example may be secured to the lower ends of these posts as by clamping screws 51 threaded to receive at their lower ends small clamping blocks as at 52. Preferably, member 48 should also have its ends soldered in position while same is subject to longitudinal tension.

The pick-up coil may be spirally wound in the form of a small disc 53 received and retained within slots therefor formed in the facing portions of the two pole pieces 41, 42. Suitable connections from this coil with the resistance 39' shunted across same, may extend as shown at 54 (Fig. 3) back along the arm and down through the hollow shaft 19 to amplifier and loud speaker equipment of any desired type.

It is noted that the lower surfaces of the pole pieces 41 and 42 are arranged in closely spaced parallel relationship with the upper surface of the record disc 14. By selecting the record-supporting mat 13 of appropriate thickness, the air gap between the pole pieces and the record support 12 of magnetic material, may be so chosen that an effective attractive force is maintained by the magnetic field tending to cause the stylus to cling within the sound track of the record despite irregularities in the track or the occurrence of forces which would ordinarily cause the stylus to jump out of the track. Also with the parts arranged as shown, by making use of this magnetic attraction, it has been found possible to obtain excellent results in playing records in which the sound track is very finely embossed, for instance with as many as 200 lines per inch, and it was found that the sapphire would not escape from the track even when the machine is tilted to angles as high as 80°. These advantages of the invention are particularly desirable if the machine is to be used by the blind since, for reasons of economy, they may have occasion to use inexpensive records for long periods after same have become worn; also, since these advantages make it possible for the blind to readily use a machine when traveling, at times when no other activities would be open to them.

It should be noted that the effect of the magnetic attraction in retaining the pick-up device in position is in various respects quite different from the effects which would be accomplished by increasing the weight of the pick-up. That is, of course, any added weight tends to increase the inertia, thereby tending to detract from the quality of the reproduction, and in case the machine is abruptly moved or jolted, or the sound track is irregular, any such increased inertia effects due to added weight will tend to cause the stylus to bounce or fly out of the track, unless the weight applied is excessive. It will be apparent that by improving the tracking with the aid of magnetic attraction, the disadvantages of using added weight for the purpose are avoided. The magnetic attraction as here used is also to be distinguished from the effects of using a spring for the purpose as has heretofore been proposed. The use of a spring involves mechanical difficulties in so positioning and attaching same that

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varying frictional effects will be avoided, while leaving the pick-up arm free for easy manipulation and proper propulsion by the stylus.

It should be noted that with magnetic attraction used as above described, the attractive force is largely in a downward direction toward the record, sidewise movements of the pick-up device being only slightly restrained magnetically. Accordingly, in order to obtain the best results with the invention, particularly on portable machines subject to abrupt movements during use, the stylus-carrying arm assembly should be substantially balanced against any tendency for angular movement about the axis of shaft 19 when the machine is tilted in any direction. Such balancing may be accomplished as best shown in Fig. 1, in the following way. If we draw a line as at *a* through the axis of shaft 19 and in a position such that the weight of counterweight 24 is equally distributed at the two sides of such line, then the weight of the pick-up and supporting arm structure therefor should also be equally distributed at the two sides of such line. Also, if we draw another line *b* perpendicular to line *a*, through the axis of shaft 19, the parts at each side of this line should be so arranged, as to position and weight, that when the axis is tilted, gravity will cause equal moments of force respectively, due to the parts at each side of line *b*. It is noted that the counterweight 24 is effective essentially in normally horizontal directions as distinguished from counterweights heretofore used on various phonograph tone arms in a manner such as to act in vertical directions about a normally horizontal axis.

As shown in Fig. 4, when the machine is not in use, the pick-up arm assembly may be turned to inactive position so that the pick-up device 32 will be supported by a rest piece 55. This may comprise a somewhat resilient piece of sheet metal bent to the shape shown in Fig. 4 and attached to the base 21, and having an upstanding stop portion 56. This piece may also be formed with a depressed area 57 for receiving the stylus or sapphire while the bottom of the pick-up casing rests upon the remaining areas. The piece 55 may be formed preferably of magnetic material accompanied if desired by a thicker piece of magnetic material 58 on its under side, whereby a strong attractive force will occur for holding the pick-up in position on the rest piece and at the same time the magnetic rest piece may be arranged to act as a keeper for the magnet.

As shown in Figs. 1-3, a switch 60 may be provided to control the circuit of the turntable motor. This switch may be of a suitable known type such as now commercially available under the name "microswitch" for example, having an operating button as at 61 positioned in the path of the lower surface of the counterweight 24. The button 61 is preferably so positioned that when the pick-up arm assembly is at any position with the stylus outside the circumference of the outer sound track on the record, then the button 61 will be depressed for disconnecting the motor. Thus whenever the pick-up arm after playing a record, is moved to inactive position, the motor and turntable will be stopped. Then after the record has been replaced, the operator without the aid of sight, can grasp the pick-up and move it over to the edge of the turntable with assurance that the turntable will be stationary and thus readily grasped with the hand to facilitate bringing the stylus into proper position before the turntable starts, and thus

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avoiding the danger of jamming the stylus against the turntable when rotating.

The above described magnetic features for holding a stylus in place with respect to a record, may also be useful in recording operations when performed by the blind. That is, a slight degree of magnetic attraction between the recording stylus and the record may be used to prevent unintended displacement of the stylus by the blind person while a record is being cut. Also it will be understood that the turntable motor control feature as correlated with the position of the stylus-carrying arm, is well adapted for use by the blind in recording apparatus.

As shown in Figs. 1 and 2, the casing cover 11 may be accompanied by brace means comprising two hinged parts as at 62, 63 of a well-known construction, for holding the cover in the desired open position when the machine is being used. To prevent injury of the pick-up parts, particularly on a portable machine, it is of course important for the pick-up assembly to be placed in inactive position on the rest piece before the cover is closed. According to the present invention, means are provided to lock or stop the cover-supporting members 62, 63 against closing of the cover until the pick-up assembly is placed on the rest piece. This may be accomplished by forming the counterweight 24 with an upstanding arcuate cam surface 64 adapted to engage an arcuately shaped lever member 65 carried by a rockable support 66 pivoted to the base at 67. The support 66 may comprise a U-shaped piece of sheet metal, to one branch 68 of which the lever 65 is connected, and the other branch 69 comprising the stopping post adapted to be swung into position under the lower end of member 63 as shown in Fig. 2, whenever the pick-up arm assembly is moved from its position on the rest piece. The support 66 may be normally biased to bring the post 69 into locking position as by a spring 66' having one end secured to the base 21 and its other end pressing against the post 69. Thus, whenever a record is being played or when the pick-up is being moved to or from its rest position, the cover will be locked against closing. For blind persons this feature is of course particularly advantageous.

In order to insure that the turntable motor circuit, lamp circuit and amplifier circuits, etc., will be disconnected when the cover is closed, a switch 70 may be mounted in the cover as shown in Fig. 2, having an operating spring 71 adapted to engage the upper surface of the counterweight 24 when the cover is closed, and, provided the counterweight is in a position with the pick-up located on the rest piece. The switch 70 may be of the same construction as the abovementioned switch 60 except for the added spring 71. This switch may be suitably connected so as to cut off the power to all of the electrical devices in the machine. But it will be particularly noted that this will only occur if the pick-up is in inactive position. Thus even if the automatic cover locking means should for any reason become defective or not be used, so that the cover is free to be closed with the pick-up not on the rest piece, then that fact will be evident to a blind person upon closing the cover, since the current to the amplifier and loud speaker will still be on and he will be able to hear the resulting slight hum.

While the invention has been described in detail with respect to a particular preferred exam-

ple, it will be understood by those skilled in the art after understanding the invention, that various changes and further modifications may be made without departing from the spirit and scope of the invention, and it is intended therefore in the appended claims to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a phonograph, the combination of a rotatable record support comprising magnetic material substantially coextensive at least with the areas of the record which include the sound track, stylus-carrying means, a support structure for such stylus-carrying means for supporting same in position for stylus engagement with the sound track, said stylus-carrying means being propellable across such record areas by stylus engagement with the sound track, and a magnet carried by said means in a position whereby successive magnetic portions of said record support form an effective part of the magnetic circuit of the magnet and thereby causing said carrying means during its travel across said record areas to be urged toward the support, for preventing escape of the stylus from the sound track.

2. In a phonograph, a record support comprising magnetic material, in combination with a magnetic "pick-up" device, a support structure for holding said magnetic "pick-up" device in close proximity to said record support, the magnet of said "pick-up" being thus positioned to apply attractive force between said device and said support during playing of the record.

3. In a phonograph, a record support comprising magnetic material for supporting a record having a groove wave sound track, stylus-carrying means mounted to travel across a record on such support, and a magnet carried by and rigidly associated with said means in a position to exert a substantially attractive force on said support for preventing escape of the stylus from the groove sound track of the record.

4. In a phonograph, a magnetic "pick-up" including a stylus-carrying means mounted to travel over a rotatable record, a magnet comprising a part of said magnetic "pick-up" and mounted to travel with said means, said magnet providing a magnetic field for the operation of said magnetic "pick-up," magnetic means extending along beneath the path of such travel, the magnet having a pole or poles positioned to apply substantially attractive force between said carrying means and the latter means, and a rest piece of magnetic material for said carrying means when inactive, said magnet being positioned to then come into close proximity with said rest piece whereby said carrying means is held in inactive position by magnetic attraction.

5. In a phonograph, a stylus-carrying arm assembly pivotally mounted to swing about a fixed normally vertical axis, said assembly including a

body member having an integral counterweight on one side of said axis and an arm on the other side thereof, said arm being pivotally connected to said body member to swing about a normally horizontal axis, the parts of said assembly being substantially balanced against angular movement of the assembly about said axis upon tilting of the phonograph, a magnet mounted to travel with said assembly, magnetic means extending along beneath the path of such travel, the magnet having a pole or poles positioned to apply substantial attractive force between the stylus-carrying means and said magnetic means during the playing of a record, for preventing escape of the stylus from the sound track of the record.

6. In a phonograph, the combination of a rotatable record support comprising magnetic material substantially coextensive at least with the areas of a record which include the sound track therefor, stylus-carrying means, a support structure for said stylus-carrying means for holding same in position for stylus engagement with the sound track, said stylus-carrying means being propellable across such record areas by stylus engagement with the sound track, and a bi-polar magnet carried by said means, the poles being on opposite sides of the stylus and in a position whereby successive magnetic portions of said record support form an effective part of the magnetic circuit of the magnet and thereby causing said stylus-carrying means during its travel across said record areas to be urged toward the support, for preventing escape of the stylus from the sound track.

7. In a phonograph, a record support comprising magnetic material, stylus-carrying means mounted to travel across the record on such support, and a bi-polar magnet carried by said means, the poles thereof being disposed on opposite sides of the stylus and in a position to exert a substantially attractive force on said support for preventing escape of the stylus from the sound track of the record.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
907,383	Lieb	Dec. 22, 1908
913,508	Kelly	Feb. 23, 1909
1,242,920	Catucci	Oct. 16, 1917
1,344,186	Morrison	June 22, 1920
1,546,931	Hinckley	July 21, 1925
1,678,116	Harrison	July 24, 1928
1,741,465	Khaira	Dec. 31, 1929
1,742,085	Kuchenmeister	Dec. 31, 1929
2,114,881	Kleber	Apr. 19, 1938
2,138,875	Miessner	Dec. 6, 1938
2,324,214	Kellogg	July 13, 1943
2,357,034	Thompson et al.	Aug. 29, 1944