

[54] **GUIDE FOR PHONO-PICK-UP**

[76] Inventor: **Karl Braun**, Passauer Str. 38, 8399
Rotthalmunster, Germany

[22] Filed: **Feb. 8, 1971**

[21] Appl. No.: **113,579**

3,101,952	8/1963	Godfrey et al.	274/23 A
3,441,331	4/1969	Kesling	308/10
2,413,206	12/1946	Worsham	274/23 A

Primary Examiner—Harry N. Haroian
Attorney—Walter Spruegel

[30] **Foreign Application Priority Data**

Feb. 6, 1970 Germany..... P 20 05 331.0

[52] U.S. Cl..... 274/23 A

[51] Int. Cl..... G11b 3/10

[58] Field of Search..... 308/10; 274/23 A,
274/23 R

[56] **References Cited**

UNITED STATES PATENTS

3,356,372 12/1967 Rabinow..... 274/23 A

[57]

ABSTRACT

Phono-pick-up guide providing a longitudinal permanent-magnet guideway receiving a permanent-magnet guidepiece which carries the pick-up, with the guidepiece having in the guideway clearance throughout, and being by magnetic forces held hovering for movement and at rest therein without contact therewith.

1 Claim, 7 Drawing Figures

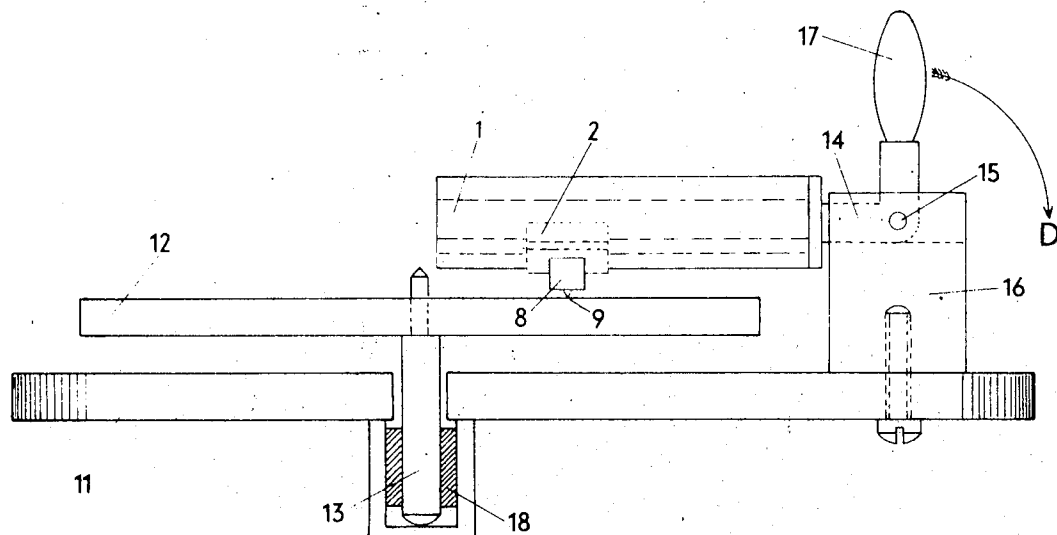


Fig. 1

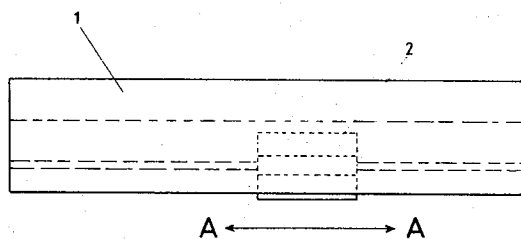


Fig. 2

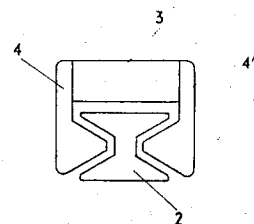


Fig. 3

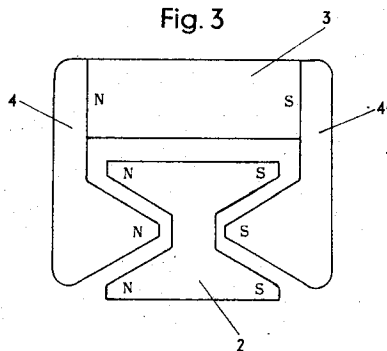


Fig. 4

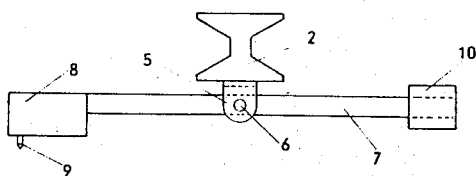
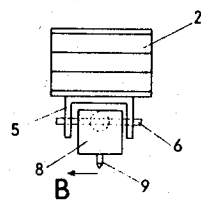


Fig. 5



INVENTOR
Karl Braun

By: *Walter Sprugel*
Attorney.

Fig. 6

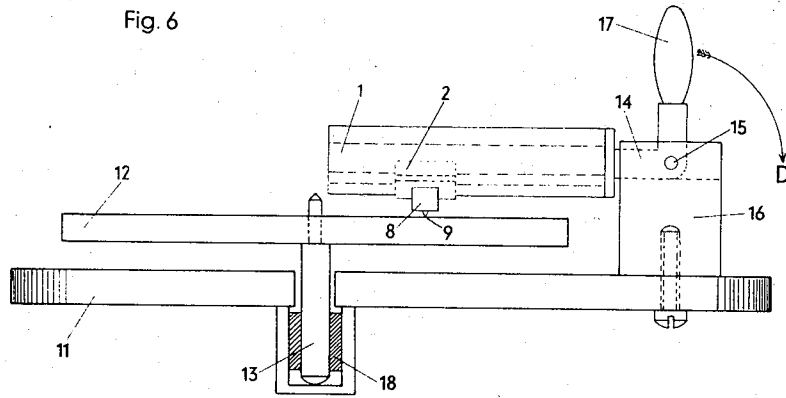
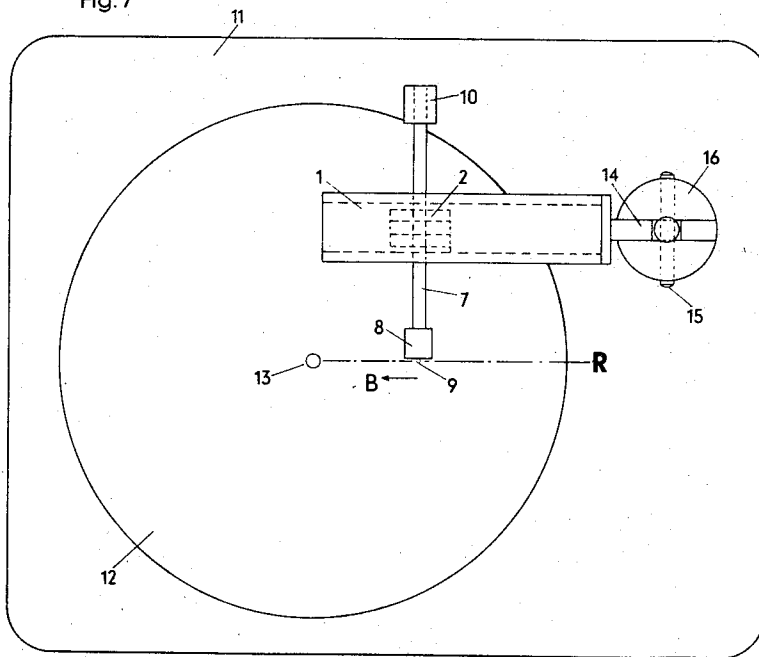


Fig. 7



INVENTOR
Karl Braun

By: *Karl Braun*
Attorney

GUIDE FOR PHONO-PICK-UP

This invention relates to a guide for a phono-pick-up the needle of which traverses a record radially thereof.

Stencils for records are cut by movement of the cutting stylus radially on the record stencil. In contrast thereto, the phono-pick-up for sound reproduction is customarily guided by a pick-up arm on a pivot support so that its needle does not move in a linear path, but moves in a circular path. As a result, wrong angle positions between the tangent of the record groove and the longitudinal axis of the phono-pick-up will form varying angles which cause sound distortions. Furthermore, with this mode of sound reproduction, an additional force urges the needle against the inner groove flank so that with stereo-edge writing in both channels different contact pressures prevail which causes still further distortion of sound reproduction. These disadvantages can be obviated by providing for guidance of the transducing head of the phono-pick-up radially on the record, i.e., along the same path along which the stylus is guided during the recording operation of the stencil. There are a number of known proposals which endeavour to solve this problem. However, all known constructions have been deficient, because sliding or rolling guide friction had to be overcome which could not be achieved by the needle. Because of this frictional resistance, an additional force acted on the needle which caused increased pressure on the outer groove edge that also led to distortions in sound reproduction. Furthermore, all known constructions are rather complex. It is to be noted that the needle is moved at a speed of about $65\mu/\text{sec.}$ and must be able to give way to lateral force of maximum 100 mp (milliponds). Furthermore, all known constructions having sliding or rolling elements for guiding the phono-pick-up, have the disadvantage that dust in conjunction with applied lubricant or the like, adversely affects the operation after some time.

It is an object of this invention to provide a phono-pick-up guide which obviates the disadvantages of the prior constructions, which is of structural simplicity and low cost, and which performs without sound distortion.

According to the invention, this is obtained in that the guide is arranged to act magnetically for holding the phono-pick-up suspended in free hovering fashion for movement in radial direction without encountering any friction from the guide. In so doing, all physical contact between the guiding and guided parts is eliminated.

The contemplated guide provides a longitudinal, and in this instance a rectilinear, guideway with a magnetic field in which the phono-pick-up, and more particularly a follower magnet thereof, is held freely suspended and encounters no magnetic resistance to its operational linear movements in the guideway instigated by the needle. Such a magnetic guideway requires but a minimum of parts and functions satisfactorily.

In the following, this invention is explained in connection with the drawings which show one embodiment of this invention.

In the drawings:

FIG. 1 shows an embodiment of a longitudinal guide operating with magnetic repulsion forces;

FIG. 2 is an end view of the guide;

FIG. 3 is an enlarged end view of the guide, with the magnetic polarities indicated;

FIG. 4 is a side view of a phono-pick-up together with its follower magnet;

FIG. 5 is an end view of the phono-pick-up;

FIG. 6 is a schematic view of the magnetic guide according to the invention in combination with a conventional phonograph; and

FIG. 7 is a top view of the overall device of FIG. 6.

Referring to the drawings, and more particularly to FIGS. 1 to 3 thereof, the reference numeral 1 designates a guideway which comprises a permanent magnet 3, and opposite ferromagnetic pole pieces or shoes 4 and 4', and in which is received a guidepiece in the form of a hovering magnet 2, which is also a permanent magnet that carries the pick-up. Magnets 2 and 3 preferably consist of a material which can be magnetized in any direction, for example, oxide-ceramics. With the polarity of the magnets as shown in FIG. 3, magnet 2 is held hovering, by magnetic repulsive forces, in the guideway between the pole shoes 4 and 4'. The magnetic forces in the direction A—A (FIG. 1) cancel each other out as long as the magnet 2 is entirely within the longitudinal confines of the magnetic guideway 1. Because the magnetic forces acting on the hovering magnet 2 in the direction A—A cancel each other out, magnet 2 encounters no resistance to movement in the direction A—A. Accordingly, the follower magnet 2 in the guideway 1 confines the operational movements of the phono-pick-up to movement in the direction A—A (FIG. 1) or in the direction B (FIGS. 5 and 7) without encountering any friction.

The air gaps between the magnets are relatively large so that settling dust or other foreign matter thereon have no effect on the guide function. In FIG. 4, there is shown an arm which at 6 is pivoted in a bearing 5 on the follower magnet 2. Carried at one end of this arm 7 is a pick-up box 8 with the needle 9, and carried at the opposite end of this arm is a counter weight 10 which is preferably adjustable. Adjustment of the counter weight 10 permits regulation of the needle pressure on a record, as will be readily understood. Because of the pivotal mount of the phono-pick-up on the bearing 5 on the follower magnet 2, the phono-pick-up will readily follow the slight planar deviations of nearly all records.

The phono-pick-up is fed by and under the control of the record grooves, whereby the same is by its follower magnet 2 guided in a free-of-contact movement in the direction B (FIGS. 5 and 7) within the magnetic guideway 1. The guideway 1 extends parallel to the desired radial course of the needle on the record. Preferably, provisions are made whereby the magnet 2 is unable to move beyond either end of the magnetic guideway 1, and will thus always remain in the magnetic guideway. To this end, recourse may be had to magnetic or mechanical end stops, of which exemplary non-magnetic, for example brass, stop pins 1a are shown in FIG. 1.

FIGS. 6 and 7 show a base 11 and a turntable 12 which is supported by bearing means 13, 18. Furthermore, the base 11 provides a bearing block 16 in which a bell crank 14 is pivoted at 15 so as to be swingable, by a handle 17, over 90° in the direction of the arrow D. The bell crank 14 carries the complete guide and phono-pick-up which, by pivoting of the bellcrank from the position shown in FIG. 6 in the direction D, can be swung from the turntable so as to permit record-changing. FIG. 7 indicates by arrow B the path of movement of the phono-pick-up, which is parallel to

the record radius R, wherefore the needle follows the record radius R.

What is claimed is:

1. A guide for a phono-pick-up device having an arm carrying a needle and counterweight at opposite ends thereof, said arm being turnably supported about a pivot intermediate its ends, said guide comprising:

an elongated rectilinear guideway comprising magnetic circuit means terminating at oppositely facing pole pieces of opposing polarities:

a magnetic guidepiece having a longitudinal axis and freely movable in the direction of its axis along said guideway,

said guidepiece having oppositely facing pole pieces of opposite polarity,

each pole piece of said guidepiece being spaced apart from, but configured to interlock with, an opposite

polarity pole piece of said guideway, whereby there is only limited freedom of movement of said guidepiece, either laterally with respect to, or rotary about, its longitudinal axis;

said magnetic circuit means and said magnetic guidepiece generating magnetic forces cooperating to hold said guidepiece anywhere in said guideway in a certain hovering disposition in which said guidepiece has lateral clearance from, and is completely out of contact with, said guideway; and, said guidepiece carrying said pivot on which said arm is turnably supported for permitting the needle on said arm to move in tracking relation with the spiral grooves in a record disc, with the needle being horizontally spaced from said guidepiece when tracking a record disc.

* * * * *

20

25

30

35

40

45

50

55

60

65