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PHONOGRAPH PICKUP CARTRIDGE

Filed Aug. 20, 1964

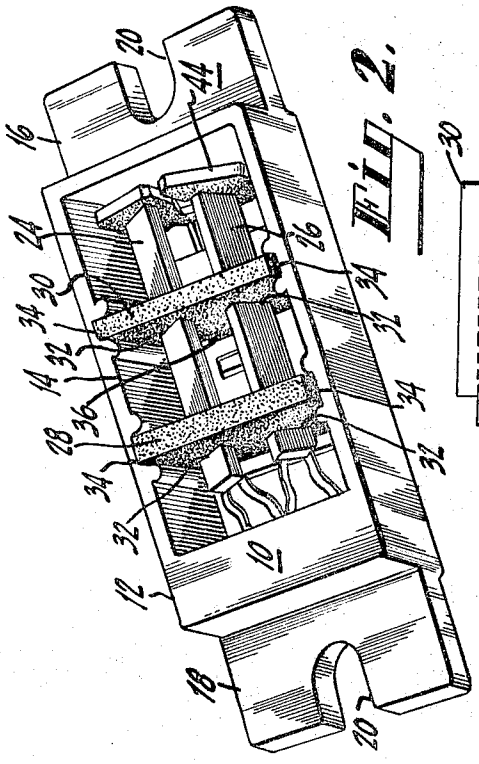


Fig. 2.

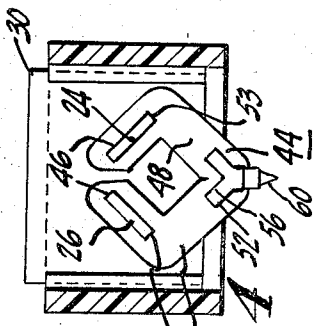


Fig. 4

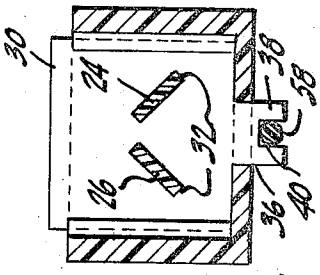


Fig. 5.

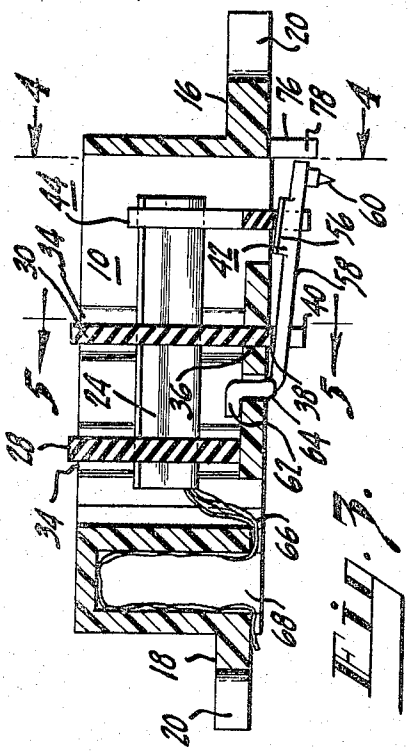


Fig. 3.

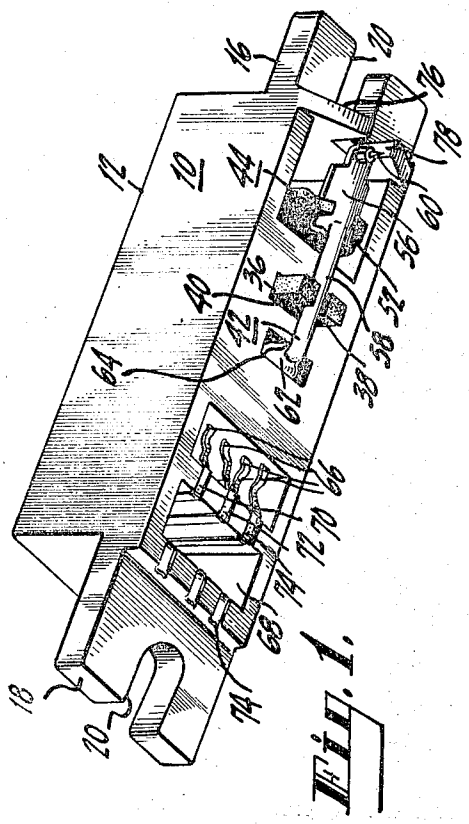


Fig. 1.

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PHONOGRAPH PICKUP CARTRIDGE

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This invention relates to electromechanical transducers and more particularly to pickups for use with phonograph record players.

Electromechanical transducers and associated mechanical parts have inherent resonant characteristics that respond to a given frequency of vibration more intensely than other frequencies. For example, in photograph pickup cartridges these mechanical resonances produce undesired peaked outputs at certain frequencies. The effect of these resonant peaks, may be reduced by providing some sort of damping from the transducer structure.

A phonograph pickup cartridge embodying the invention includes an electromechanical transducing element which is coupled to a mechanical system for imparting mechanical vibrations to the transducing element. A damping member which engages the transducing element has a portion which extends into engagement with a portion of the mechanical system and thus not only serves to damp the resonances of the transducing element but also to damp the resonances of the mechanical system.

In accordance with a further embodiment of the invention, the damping member also serves to retain the transducing element and at least a portion of the mechanical system in predetermined desired positions.

FIGURE 1 is an enlarged perspective bottom view of the pickup cartridge assembly embodying the invention;

FIGURE 2 is a perspective top view of the pickup cartridge assembly of FIGURE 1;

FIGURE 3 is a sectional side view taken along the longitudinal axis of the pickup cartridge assembly of FIGURE 1;

FIGURE 4 is a sectional front view of the pickup cartridge assembly taken along the section line 4—4 of FIGURE 3; and

FIGURE 5 is a sectional front view of the pickup cartridge assembly taken along the section lines 5—5 of FIGURE 3.

In referring to the drawings, like reference numerals designate the same components throughout the figures. The pickup cartridge **10** (FIGURES 1 and 2) includes a substantially rectangularly shaped casing **12** of molded plastic with a rectangularly shaped exposed cavity **14** as viewed in FIGURE 2. Extending in opposite directions from the ends of the casing **12** are two mounting lips **16** and **18**, each having a U-shaped slot **20** cut or molded therein. The pickup cartridge **10** is adapted to be fastened to the free end of a tone arm not shown, by a pair of mounting screws that extend through the slots **20** and firmly capture the lips **16** and **18**.

In the present example, housed within the cavity **14** are a pair of elongated piezoelectric transducing elements **24** and **26** of rectangular cross-section. These transducing elements are supported by a pair of rectangularly shaped spaced, rear and middle, rubber damping blocks **28** and **30** (FIGURES 2 to 5) which have openings **32** cut or molded therein for receiving and accurately positioning the transducing elements **24** and **26** with respect to each other. In order that the transducing elements **24** and **26** are accurataely positioned with respect to the cartridge casing, the damping blocks **28** and **30** are respectively received in two pairs of guideways or grooves **34** which are formed on opposite sides of the cavity **14** in planes perpendicular to the sides of the cavity (FIGURE 2).

The dimensions of the damping blocks **28** and **30** are made slightly greater than the internal dimensions between the casing grooves **34** so that as these damping blocks are inserted between the grooves, sufficient pressure is provided to anchor the transducing elements securely in position. The transducer element mounting means as described is also adaptable in a similar fashion to a single transducer element monaural pickup assembly.

The rear damping block **28** is thicker than the middle damping block **30** so that the transducer elements are anchored more rigidly by the rear damping block **28** than by the middle damping block **30**. The middle damping block **30** has a rectangularly shaped extended bottom portion **38** that fits through a rectangular slot **36** in the bottom of the casing **12** (FIGURES 1 and 5). The extended portion **38** is formed with a U-shaped groove or slot **40** to capture and resiliently grip a portion of a pickup cartridge stylus arm **42**.

The openings in the damping blocks **28** and **30** are cut so that the major surfaces of the transducing elements **24** and **26** lie in perpendicular planes, with each plane disposed at an angle at 45° to a plane extending vertically through the longitudinal axis of the pickup casing. The free ends of the transducing elements **24** and **26**, which are arranged and polarized to produce a voltage in response to a twisting stress, are driven by a yoke member **44** (FIGURES 2 and 4). Yoke member **44** is formed of an elastomer type material and has a pair of apertures **46** for receiving the transducing elements **24** and **26**. The yoke member **44** has a pair of divergent legs **48** and **50** which are perpendicular to the plane of the transducing elements **24** and **26**. The divergent legs **48** and **50** are stationary axially but flexible in directions normal to said axis. Any axial force or vibration on a yoke member divergent legs **48** or **50** is transmitted to a divergent edge **53** of the connected transducer element (FIGURE 4) causing a twisting torque on the transducer element. The bottom of the yoke member **44** in the present example includes a V-shaped resilient socket **52** with a pair of slots disposed at right angles and running parallel to the axes of the yoke legs **48** and **50** adapted to clamp around a similarly shaped portion of stylus arm.

The stylus arm **42** includes an elongated thin beam section **58** having a stylus mounted at one end and with a mounting hook or catch **62** formed at the other end. In the present example, the stylus **60** is mounted with its vertical axis (FIGURE 3) disposed generally perpendicular to the elongated axis of the beam section **58**, although the disposition of the stylus axis may vary with the type of stylus and stylus mounting used. The mounting hook or catch **62** comprises two sections or surfaces disposed at approximate right angles connected by a curved portion. The upper surface of catch **62** (as viewed in FIGURE 3) lies displaced vertically from the elongated axis of beam section **58** in a plane and approximately parallel (at a slight tilt) to the elongated axis. The plane of the upper surface also lies generally normal to the vertical axis of the stylus **60**. Depending upon the size of the yoke member **44** and its extension from the casing **12** and the type of stylus **60** and stylus mounting used, the angular relationship between the above-mentioned components can be modified to fit the particular situation.

The stylus arm **42** is pivotally mounted on the pickup cartridge by placing the upper surface of the catch **62** into a rectangularly shaped mounting hole **64** and then swinging the arm up towards the cartridge so that both surfaces of catch **62** swing into the mounting hole **64** and the lower side of the upper surface engages the cavity **14** interior wall while the V-shaped legs **56** snap into resilient socket **52** on the yoke member **44**. In the process the extended damping block portion **38** of the middle

damping block **30** resiliently grips and positions the stylus arm **42** at a point between the catch **62** and the V-shaped legs **56**, thereby providing damping of the stylus arm as well as for the transducing elements **24** and **26**. The above described stylus arm mounting assembly permits a limited freedom of movement in the vertical and lateral directions so that the stylus **60** can follow the recorded information in a record groove and also prevents the stylus arm **42** from rotating about its longitudinal axis. The stylus arm **42** is protected against excessive pressure or accidental dropping by the slotted V shaped extension **76**. As pressure on the stylus **60** increases, the stylus arm **42** pivots upward (as viewed in FIGURES 1 and 3) until the stylus **60** swings into the slot **78** whereby the V shaped extension **76** bears any excessive pressure.

Electrical connections are provided for the transducer elements by flexible conductors **66** which are connected between the various electrodes of these elements and are laid in a rectangularly shaped cavity **68** in which are formed terminals **70**, **72** and **74** and into which a plug can be inserted. One of these terminals, such as terminal **72**, may serve as a common terminal for piezoelectric elements. If desired, four terminals may be provided, two for each transducing element. Connections from the terminals to the phonograph amplifier may be made in the usual manner by conductors extending along the tone arm. Thus electrical signals corresponding to one of the separable recordings may be derived from one of the terminals and electrical signals corresponding to the other recording may be derived from the other terminal.

The above described damping blocks **28** and **30** provide damping of mechanical resonances thereby creating a relatively desirable smooth amplitude-vs-frequency response of a high quality phonograph pickup cartridge. In addition to damping the mechanical resonant peaks of the transducer elements **24** and **26**, the block **30** provides a cantilever joint about which the transducer elements are twisted. The cantilever effect results in increased stress on the transducer element for a given amount of stylus movement thereby increasing the electrical output of the transducer element. Furthermore, the extended portion **38** resiliently grips the stylus arm **42** to dampen any natural resonant frequencies in the stylus arm and also any noise generated by a loose pivot mounting joint.

The above described phonograph pickup cartridge assembly can be modified to include a single transducer element where it is desired to produce a cheaper type pickup cartridge for presently existing single recording records. In such a case, the damping blocks **28** and **30** require only a single aperture and the yoke member **44** may be modified for single transducer element operation.

What is claimed is:

1. In combination with a phonograph pickup with at least one mechanical-to-electrical transducing element and a stylus arm with an attached stylus coupled to the transducing element by means of a yoke member:

a damping block of resilient material having openings therein receiving and positioning said transducer elements and receiving, supporting said stylus arm.

2. In a phonograph pickup with at least one mechanical-to-electrical transducing element and a stylus arm including a stylus, coupled to the transducing element by means of a yoke member:

a damping block of resilient material having openings therein receiving and positioning said transducer element and receiving said stylus arm;

a casing, and

means for mounting said damping block in said casing to anchor said transducing element in a predetermined position in respect to said stylus arm.

3. In combination with a phonograph pickup with a pair of mechanical-to-electrical transducing elements and a stylus arm including a stylus, coupled to said transducing element by means of a yoke member:

a damping block of resilient material having a pair of openings therein receiving and positioning said transducing elements relative to each other and an opening therein receiving and resiliently gripping said stylus arm.

4. In a phonograph pickup assembly including at least one elongated end mounted mechanical-to-electrical transducer element, a stylus arm including a pickup stylus at the free end, a yoke member for transmission of vibrations from an intermediate point on the stylus arm to the free end of the transducer elements comprising:

a damping block of resilient material having openings therein receiving said transducer elements, said damping block resiliently anchoring said transducer element at an intermediate point between said transducer mounted end and said transducer free end, said damping block having an extended portion formed with an opening therein receiving and resiliently gripping said stylus arm.

5. A phonograph pickup assembly comprising:

a pair of mechanical-to-electrical transducing elements responsive to flexing of a major surface thereof to produce corresponding electrical signals;

a single piece yoke member having a pair of divergent legs and a slotted central portion, said legs each engaging a different one of said mechanical-to-electrical transducing elements;

a stylus arm pivotly mounted at one end thereof and having a record engaging stylus at the opposite end thereof, a portion of said stylus arm between the ends thereof adapted to ride in said slotted central portion of said yoke to transmit vibrations imparted to said record engaging stylus through said yoke member to said transducing elements, and

a damping block of resilient material formed with a pair of openings therein receiving and positioning said transducing elements relative to each other and formed with an opening therein receiving and resiliently gripping a portion of said stylus arm between said pivotly mounted end and the portion adapted to ride in said yoke central slotted portion.

6. A phonograph pickup assembly comprising:

a pair of mechanical-to-electrical transducing elements each having a rectangular cross-section;

a single piece yoke member having a pair of divergent legs and a reentrant central portion, said legs each engaging a different one of said mechanical-to-electrical transducing elements;

a stylus arm pivotly mounted at one end thereof and having a record engaging stylus at the opposite end thereof, a portion of said stylus arm between the ends thereof adapted to be captured in the reentrant central of said yoke to transmit vibrations imparted to said record engaging stylus through said yoke member to said transducing elements;

first and second resilient damping blocks, each having a pair of openings therein for receiving and positioning said transducer elements relative to each other, said first damping block resiliently gripping said pair of mechanical-to-electrical transducing elements at an intermediate point between the ends thereof, said first resilient damping block having an extended portion formed with a slot therein resiliently gripping a portion of said stylus arm between the pivotly mounted end and the yoke engaging portion, said second resilient block gripping said mechanical-to-electrical transducing elements at the end opposite the end engaging the yoke member, said second damping block having a thicker cross-section than said first damping block;

a casing, and

means for mounting said damping block in said casing to anchor said transducing elements in a predetermined position in respect to said stylus arm.

7. In a phonograph pickup of the type having a casing supporting an electromechanical transducer and having a coupling member extending from said transducer in the direction of one side of said casing comprising:

a stylus arm having an elongated beam supporting a record engaging stylus at one end thereof, said stylus axis being disposed approximately normal to the axis of elongation of said beam, said stylus arm also providing a mounting portion at the opposite end of said elongated beam, said mounting portion including a first section connected to said beam and being disposed generally perpendicular to the axis of elongation of said beam and a second section lying in a plane generally perpendicular to said first section and said stylus axis but spaced away from said axis of elongation,

said casing including an aperture in said side thereof spaced from said coupling member, said stylus arm being assembled to said casing with said second section proectjed into said casing through said casing aperture and engaging said casing to lock said mounting portion in position and with said stylus arm extending into engagement with said coupling member;

a damping block of resilient material having openings therein for receiving and positioning said electromechanical transducer and for receiving said stylus arm, and

means for mounting said damping block in said casing to anchor said electromechanical transducer in a predetermined position in respect to said stylus arm.

8. A phonograph pickup as defined in claim 7 wherein said coupling member is formed with a reentrant portion that captures a portion of said stylus arm when said stylus arm is assembled on said casing.

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