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Honma

[11] **3,720,796**

[45] **March 13, 1973**

[54] MULTICHANNEL PICKUP CARTRIDGE

[75] Inventor: **Kimiyasu Honma,** Tokyo, Japan

[73] Assignee: **Kabushiki Kaisha Audio-Technica,** Tokyo, Japan

[22] Filed: **Aug. 4, 1971**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 737,998, June 18, 1968, abandoned.

[30] **Foreign Application Priority Data**

June 20, 1967 Japan 42/53200

[52] **U.S. Cl.** ..... **179/100.41 K,** 274/37

[51] **Int. Cl.** **H04r 11/12**

[58] **Field of Search** ..179/100.41 K, 100.41 S, 100.41 M,179/100.41 Z; 274/37

[56] **References Cited**

UNITED STATES PATENTS

2,864,897	12/1958	Kaar	179/100.41 K
3,115,554	12/1963	Smits	179/100.41 K
3,184,555	5/1965	Marshall	179/100.41 K
3,294,405	12/1966	Pritchard	179/100.41 K
3,299,219	11/1967	Madsen	179/100.41 K

FOREIGN PATENTS OR APPLICATIONS

718,099	9/1965	Canada	179/100.41 K
1,000,035	8/1965	Great Britain	179/100.41 K
1,203,541	11/1960	France	179/100.41 K

Primary Examiner—Raymond F. Cardillo, Jr.
Attorney—Saul Jecies

[57] **ABSTRACT**

A multichannel pickup cartridge is provided with a cantilever arm having a stylus tip attached to one end thereof and a pair of magnet armatures attached to the other end thereof so as to extend in a plane perpendicular to the axis of the arm and in a configuration corresponding to the both modulated walls of a groove on a record disk. Each armature is associated with a magnetic gap formed by a pair of pole pieces which are part of an electromagnetic transducer. A suspension rod is fixed at one end to the other end of the cantilever arm and secured at the other end, under tension, to a cartridge housing to provide a tensioned support to the arm. The rod has flexibility to permit the angular movement of the cantilever arm.

9 Claims, 11 Drawing Figures

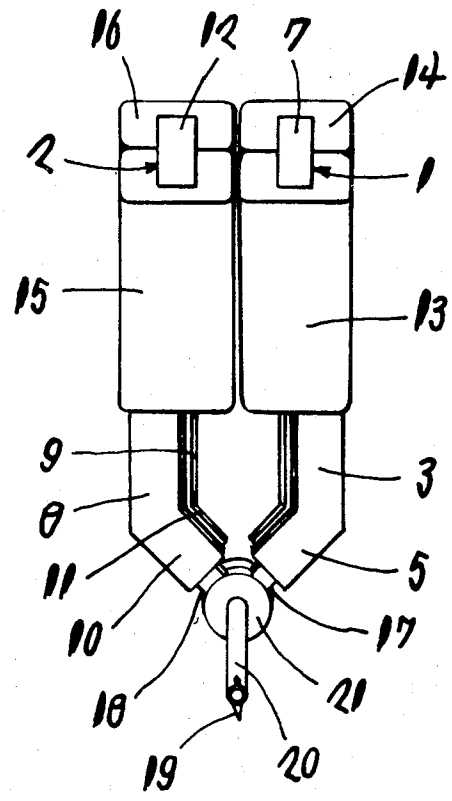


FIG. 1

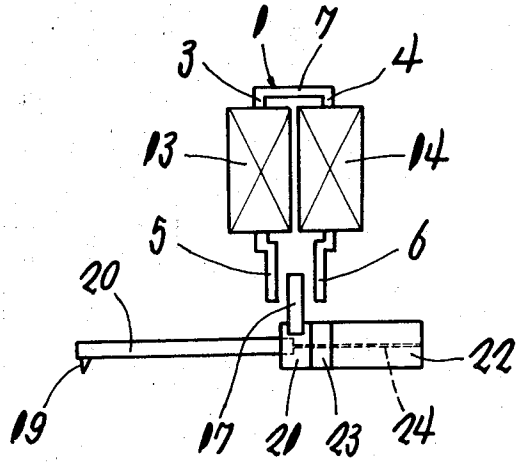


FIG. 2

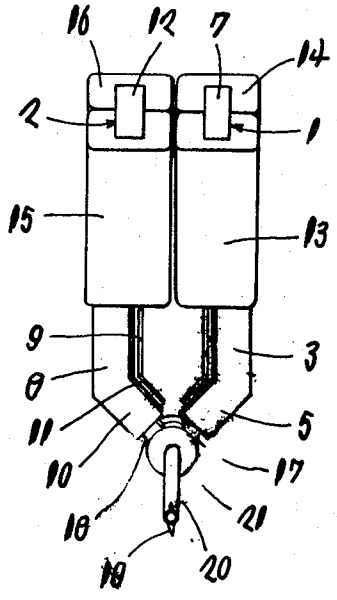


FIG. 3

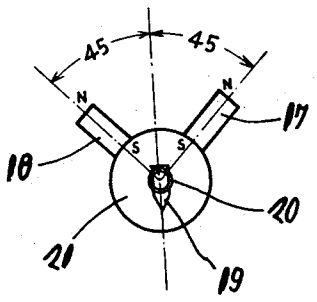


FIG. 4

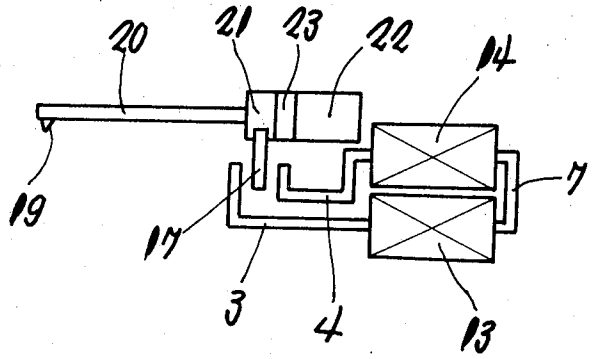


FIG. 5

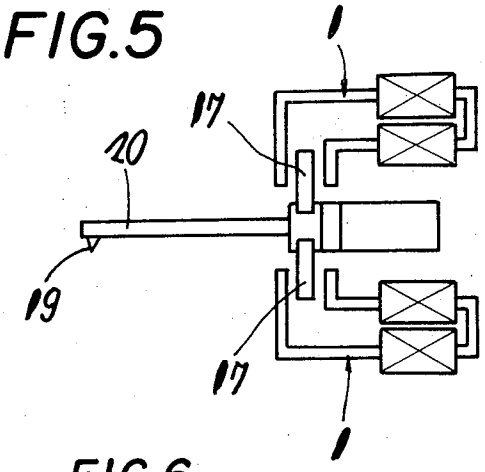


FIG. 6

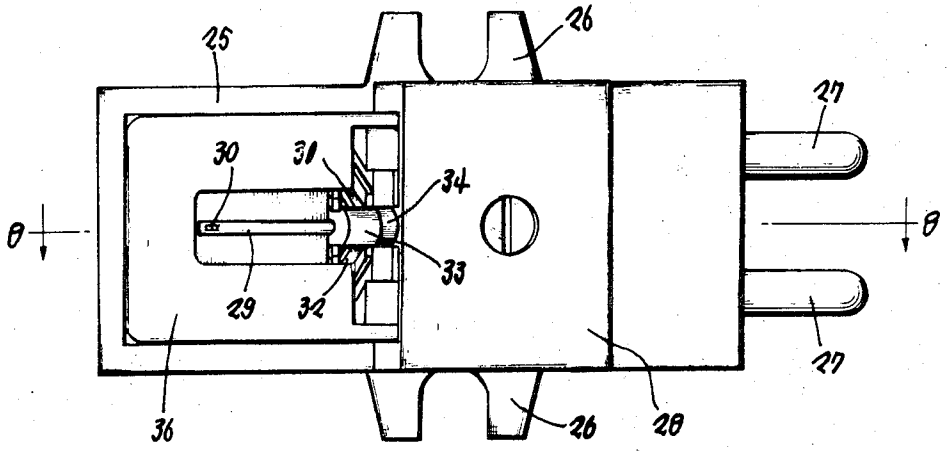


FIG. 7

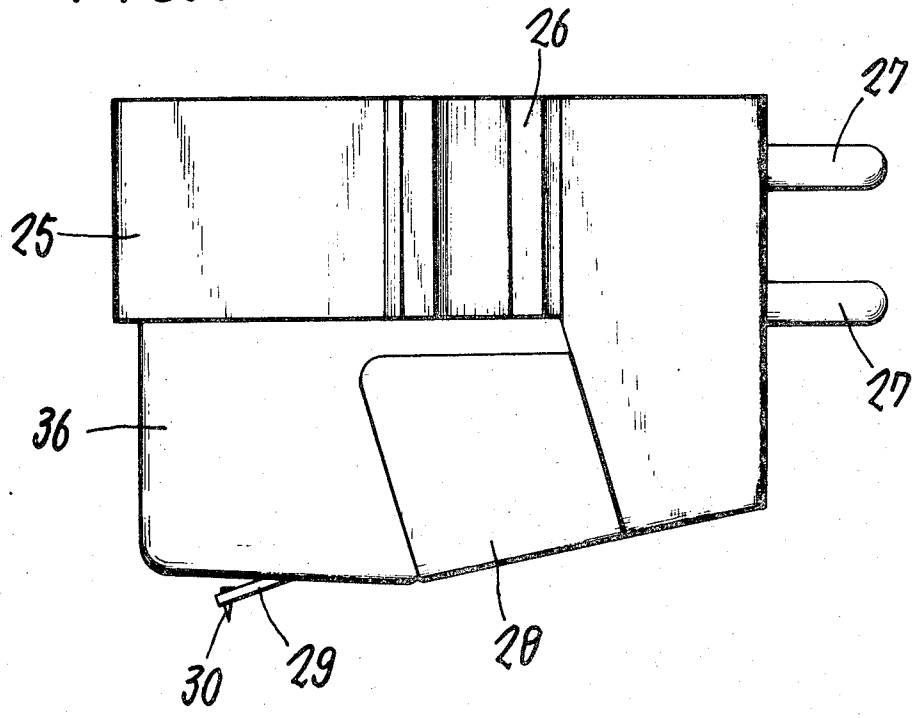


FIG. 9

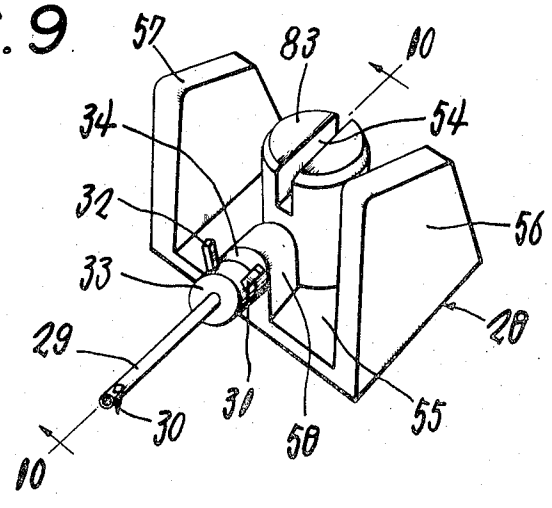


FIG. 8

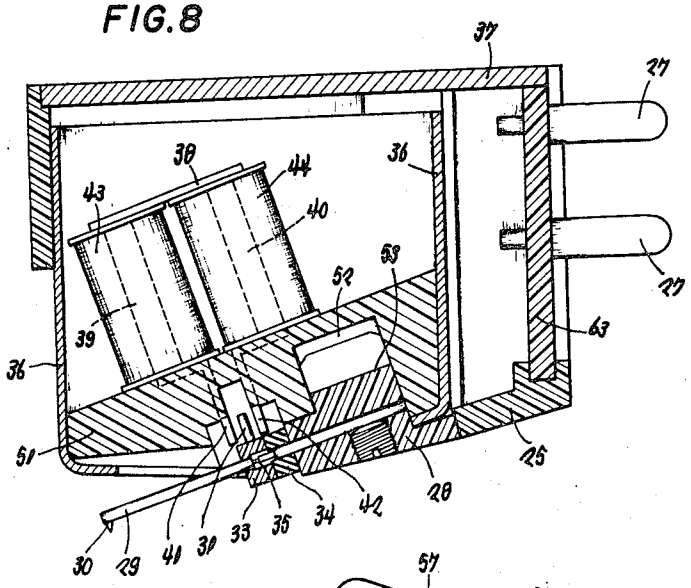


FIG. 10

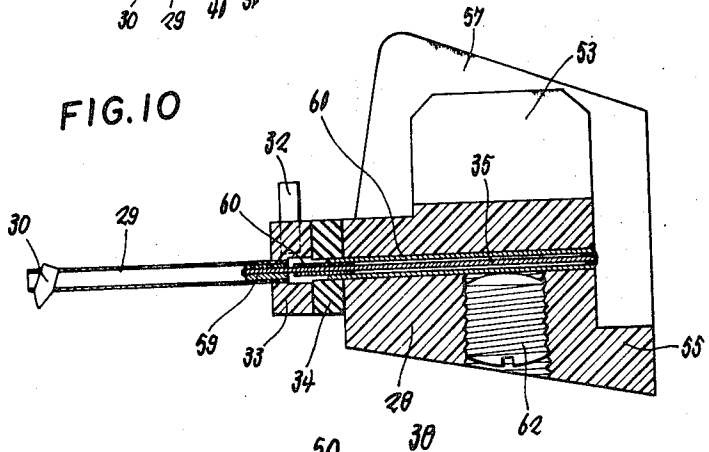
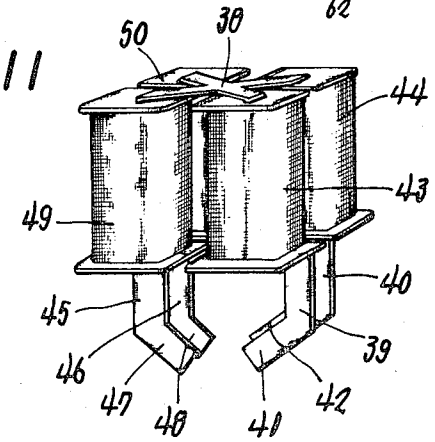


FIG. 11



MULTICHANNEL PICKUP CARTRIDGE

This application is a continuation-in-part of application Ser. No. 737,998 filed June 18, 1968, now abandoned.

The invention relates to a multichannel pickup cartridge adapted for simultaneous reproduction of multichannel signals from a record disk having a groove with two walls each modulated with respect to each other, and more particularly, to a novel arrangement of pickup armatures on a cantilever arm and support thereof.

Multichannel disks are usually recorded by the use of two major recording methods, one being the so-called lateral-vertical system in which one of the channels is recorded laterally and the other vertically. In the other method, which is generally referred to as the 45° —45° system, a channel is recorded on each of the two sides of the groove which form an angle of 45° with respect to the disk surface. While many other suggestions have been made to date, the 45° —45° system is most favored in practical use because of its excellent fidelity and improved channel separation. While, for the purpose of reproducing sounds from record disks groove in such multichannel system as above stated, a pickup cartridge of moving magnet type is recognized to be most advantageous in view of the performance stability and high conversion efficiency achieved as well as relatively low cost that is required for its production. A stereophonic pickup cartridge which is typical of the moving magnet type is disclosed for example in the U.S. Pat. No. 3,077,522 and others. It is already known that as compared with a cartridge of moving magnet type, a cartridge of moving coil type provides a more delicate aural sensation in sound reproduction. This is because an essentially higher resonance frequency in the high frequency region and a very favorable tracking response are obtained with the cartridge of the latter type. It will then been seen that a most favorable cartridge would be provided if such beneficial features of the moving coil type cartridge could be realized with a cartridge of the moving magnet type, since in other respects, the latter design is preferred. However, the prior art attempts directed to such improvements failed to accomplish the desired results.

Considering the peak of the cartridge response in the high frequency range, it is known that the resonance frequency in the high frequency range is given by the following expression:

$$f_h = (1/2\pi) \sqrt{(Sa + Sr)/Ma} \quad (1)$$

where f_h is the resonance frequency in the high frequency range,

Ma is the equivalent mass of a cartridge vibration system, and

Sa and Sr are the equibalent stiffness of the vibration system and of a record, respectively.

The above formula applies on the assumption that the equivalent mass of a pickup arm is greater by a factor of several hundreds than the equivalent mass of the cartridge vibtation system and therefore can be omitted from consideration. As is well known, the equivalent stiffness of the cartridge vibration system, Sa, is by one order of magnitude less than the equivalent stiffness of the record, Sr, so that it may be neglected for the present purpose. Thus the formula (1) can be rewritten as follows:

$$f_h = (1/2\pi) \sqrt{Sr/Ma} \quad (2)$$

Once the radius of a sphere which forms the stylus tip of the cartridge is determined, the equivalent stiffness of the record, Sr, can be considered as a constant for almost all practical purposes. Then it is apparent that a reduction in the equivalent mass of the cartridge vibration system, Ma, is essential in order to raise the response frequency in the high frequency range. The equivalent mass of the vibration system, Ma, is given by the following formula:

$$Ma = Ta/L_a^2$$

where Ia is the moment of inertia of the vibration system, and

L_a is the length or distance from the fulcrum of the vibration system to the stylus tip.

The length L_a of a cantilever arm must be limited for the reason of avoiding flexure and secondary resonance thereof, as well as from output considerations. As a result, a reduction in the equivalent mass of the vibration system necessitates a reduction in the moment of inertia.

As a matter of practice, while a reduction in size or a suitable choice of configuration of various elements of the vibration system such as magnet armature, cantilever arm and stylus tip is effective in reducing the equivalent mass of the vibration system, such approaches fail to provide a satisfactory solution due to the presence of signifinant restrictions which are imposed when the prior art construction is employed.

Therefore, it is an object of the invention to provide an improved stereophonic pickup cartridge which completely or substantially eliminates the disadvantages mentioned above.

It is another object of the invention to provide a stereophonic pickup cartridge which has an increased resonance frequency in the high frequency range and maintains a good tracking response to sound grooves, thereby enabling reproduction of sound with a high fidelity.

It is a further object of the invention to provide a stereophonic pickup cartridge which is provided with a stylus assembly that can be readily placed into the body of the cartridge, maintained in proper orientation over a prolonged period of use and readily removed for replacement when a stylus tip becomes worn out.

In accordance with the invention, a pair of magnet armatures are located at or adjacent the fulcrum of the vibration system, to minimize the moment of inertia thereby greatly reducing the effective mass of the armatures which occupies a large proportion of the entire mass of the vibration system. This allows the achievement of a substantial reduction in the equivalent mass of the vibration system and hence an increase of the resonance frequency in the high frequency range. At the same time, the tracking response is improved to track rapid and minute changes in the sound groove, thereby enabling a high fidelity reproduction. The disposition of the magnet armatures at or adjacent the fulcrum of the vibration system is also advantageous in maintaining good channel separation. A high degree of channel separation which remains unchanged with the variation of frequency and sound level is a prerequisite to obtain stereophonic sensation and deepness of sound. Should the degree of channel separation vary, the source of sound reproduced, as sensed by aural or-

gan, would be uncertain in position, whereby the stereophonic effect would be diminished.

To this end, according to the invention, a flexible suspension rod or support wire is attached to the rear end of a cantilever arm and extends lengthwise of the arm rearwardly. The other end of the rod is anchored to a stationary support or cartridge housing so as to keep the rod under tension. To provide for free angular movement of the cantilever arm, a damper member is interposed between the rear end of the arm and the support, preferably in abutting engagement with the support. Preferably, a support pipe extends from the stationary support in alignment with the axis of the arm, to a position close to the rear end of the arm, and receives the rod. That part of the rod which is left free between the arm and the support pipe defines a fulcrum for the vibration system. An armature support member is fixedly mounted on the rear end of the cantilever arm and is channel-sectioned to locate the magnet armatures in a plane passing through the fulcrum and perpendicular to the rod which is aligned with the axis of the arm. The damper member mentioned above is placed between the channel-shaped armature support member and the stationary support, and is centrally bored to allow passage of the support pipe therethrough. The pair of armatures which correspond to the respective channels are arranged to extend in said plane at same angles to each other, for instance, at an angle of 45° with respect to a vertical plane which includes the axis of the cantilever arm. Each armature is associated with a magnetic gap defined by a pair of pole pieces of a core having a coil thereon. The arrangement is such that the movement of an armature in its associated gap away from one of the pole pieces and nearer to the other causes a voltage to be induced across the coil, while the movement of the armature in a direction parallel to the opposing surfaces of the pole pieces does not cause an induction of voltage. In operation, for instance, assuming that only one of the channels in the groove cut according to the 45°— 45° system is modulated and the other flat or unmodulated, one of the armatures which is positioned on the opposite side of the modulated channel with respect to the above mentioned vertical plane will be subjected to angular movement about the fulcrum generally in the direction of the gap length to thereby change the magnetic flux in the associated gap, while the other armature remains unchanged in position and merely undergoes a rotational movement about its own axis with no consequent change in the magnetic flux in the associated gap. The same applied when the both channels are modulated, each armature being influenced only by its associated channel and independent from the modulation of the other channel. Thus the cartridge according to the invention achieves a high channel separation. Where the armatures are positioned remote from the fulcrum of the vibration system, it will be seen that such an advantageous channel separation can not be obtained, since the motion of the stylus tip subjected to the modulation of only one channel is likely to produce a composite movement of the cantilever arm which undesirably operates both of the armatures. Poor channel separation found with a cartridge having a single cylindrical magnet armature secured lengthwise to a cantilever arm is thus avoided. In addition, the tensioned rod prevents any axial displacement of the cantilever arm under the influence of the friction between the stylus tip and the groove of the record, which friction exerts a pulling force acting in the running direction of sound groove upon the cantilever arm. In a prior art arrangement in which the cantilever is supported by a bearing of elastic material, the cantilever was pulled by such force, while causing deformation of the bearing, to cause the cross modulation of the both channels as mentioned previously.

By virtue of the magnet armatures being directly disposed within the gap between the pole pieces without the use of any surrounding sleeve, the gap size can be decreased to less than half that of the prior art construction, thereby permitting a considerable increase in the conversion efficiency.

Further details and advantages of the invention will appear as the description proceeds with reference to the embodiments thereof shown in the drawings, in which

FIG. 1 is a side elevation of a transducer used in the stereophonic pickup cartridge according to the invention,

FIG. 2 is an end view of the embodiment of FIG. 1,

FIG. 3 is an end view, as viewed from the stylus tip side, of the stylus assembly shown in FIGS. 1 and 2,

FIG. 4 is a side elevation of another form of the transducer which is similar to the embodiment of FIG. 1 except that the electromagnetic generator is arranged below the stylus assembly.

FIG. 5 is a side elevation of a transducer for the stereophonic pickup cartridge of the invention which is provided with two sets of electro-magnetic generators,

FIG. 6 is a bottom view of a stereophonic pickup cartridge of the invention which employs the transducer shown in FIG. 1,

FIG. 7 is a side elevation of the embodiment of FIG. 6,

FIG. 8 is a section along the line 8—8 shown in FIG. 6,

FIG. 9 is a perspective view of the stylus assembly,

FIG. 10 is a section, to an enlarged scale, along the line 10 —10 shown in FIG. 9 and,

FIG. 11 is a perspective view of the electro-magnetic generator.

First referring to FIGS. 1 to 3 inclusively, the transducer shown comprises a pair of magnetic cores 1 and 2 arranged in juxtaposition, but spaced apart sufficiently to have independent magnetic fields where a gap is formed. Core 1 is formed in two parts 3 and 4, each having an extension 5 or 6 which is bent towards the opposite core 2 so that when assembled, it forms an angle of 45° with respect to the vertical. The core parts 3 and 4 are connected together by a yoke 7, so that the core 1 is U-shaped in elevation. Core 2 is similarly constructed to have parts 8 and 9 having extensions 10 and 11 which are bent towards the core 1 so that they form, when assembled, an angle of 45° with respect to the vertical, the parts 8 and 9 being connected together by a yoke 12. The parts 5, 6 and the parts 10, 11 thus extend on opposite sides of a vertical mid-plane therebetween with an angle of 45° thereto and at right angles to each other. Each of the core parts is provided with a coil for production of an induced voltage, and coils 13, 14 wound around the core parts 3, 4, respe-

tively, are connected in series as are coils **15**, **16** wound around the core parts **8**, **9**, respectively. Pairs of core extensions **5**, **6** and **10**, **11** form a pair of magnetic gaps in which a pair of magnet armatures **17**, **18** are disposed in a manner to maintain proper orientation. These armatures are fixed to the rear end of a cantilever arm **20** which carries a stylus tip **19** at its other or forward end. The motion of the stylus tip must be transmitted correctly to the armatures **17**, **18** which therefore are positioned to extend in the 45° direction with respect to the vertical in a plane perpendicular to the axis of the cantilever arm **20** so as to be in alignment with the respective magnetic gaps. In the example shown, the armatures are not directly fixed on the cantilever arm **20**, but are secured to an armature support member **21** which is fitted on the arm. The armatures are shown to be square in Section, but may have any other form of section. As shown in FIG. **3**, the armatures are axially magnetized.

The support mechanism which carries the vibration system so as to position the magnet armatures at proper locations within the respective magnetic gaps will be described in detail later, and it will be sufficient to describe here that it comprises a suspension rod or support wire **24** secured to and extending rearwardly from the rear end of the cantilever arm **20**. The suspension rod **24** has its other end secured to a knob **22** and is held under proper tension. A damper **23** of elastic material interposed between the armature support member **21** and the knob **22** cooperates with the suspension rod **24** to transmit any oscillatory motion of the stylus tip **19** to the magnet armatures **17** and **18**.

FIG. **4** shows a slightly modified embodiment, in which the electromagnetic generator including the cores and associated coils is arranged below the magnet armatures. In addition, the magnet armatures of this stylus assembly are disposed to extend downwardly so as to occupy their position within the magnetic gaps of the electromagnetic generator. This arrangement could be used where the cantilever arm **20** could be retained at a vertical angle of 15°. However, the design of the body of the cartridge is frequently such that a large space below the body is prevented, and hence the configuration of cores used in the electromagnetic generator of this arrangement may require a special design consideration.

FIG. **5** shows a transducer which comprises a combination of the transducers shown in FIG. **1** and FIG. **4**. This provides a transducer of an increased conversion efficiency, provided the increase of the equivalent mass of the vibration system which results from the addition of two magnet armatures can be compensated for by some means.

An embodiment of the stereophonic pickup cartridge employing the transducer of FIG. **1** is fully shown in FIGs. **6** to **11** inclusively. FIG. **6** shows the bottom of the body of the cartridge and the stylus assembly. All the components or members of the cartridge are assembled in place in a casing **25** of plastic material. The casing **25** is formed with a pair of flanges **26** for mounting onto a tone arm (not shown), and also has connection terminals **27** for supplying reproduced signals to an amplifier. The stylus assembly is adapted to be fitted in a socket that is formed in the body substantially at the center of the casing **25**. In this figure, components constituting the stylus assembly are shown to include a support knob member **28**, a cantilever arm **29**, a stylus tip **30**, a pair of magnet armatures **31** and **32**, an armature support member **33** and a damper **34**. As mentioned previously in connection with FIG. **1**, the magnet armatures are arranged at the rear end of the cantilever arm **20** so as to lie in a plane perpendicular to the length thereof and in a 45°—45° orientation with respect to the vertical. The armatures are fixedly mounted on the armature support member **33** which is fitted on the cantilever arm **29**. The damper **34**, disposed rearwardly of the armature support member, is formed of elastic material, for example, a synthetic rubber such as butyl rubber, and allows the transmission of any oscillatory movement of the stylus tip **30** to the magnet armatures **31** and **32**. In order to support the vibration system which comprises the cantilever arm **29**, stylus tip **30**, the pair of magnet armatures **31**, **32** and the armature support member **33**, the cantilever arm **29** is subjected to rearwardly acting tension by means of a suspension rod **35** (FIGS. **8** and **10**). The function of the suspension rod will be described more fully later, but it is to be noted that the transmission of motion from the stylus tip to the armatures is achieved by cooperation of the damper **34** with the suspension rod **35**.

The stylus assembly is mounted on the body of the cartridge by holding the both sides of the knob **28** with fingers and inserting it into the socket, whereupon the stylus assembly is placed in proper orientation within the body of the cartridge and the stylus tip **30** projects a small length from the body (FIG. **7**). The casing **25** is provided with a magnetic shielding which comprises a shell **36** extending across the opening of the casing except for a free space for admission of the stylus assembly. The magnetic shielding prevents stray fields from influencing upon the magnetic field within the magnetic gaps associated with the magnet armatures **31** and **32**.

FIG. **8** shows a vertical section through the entire cartridge according to the invention. The casing **25** is attached with a terminal board **63** at its rear end, the board **63** being a separate member from the casing **25** and carrying the terminals **27**. The casing **25** is closed at its top by a lid plate **37**, which can be mounted in place after the transducer has been loaded in the casing **25**.

The electromagnetic generator of the transducer comprises a pair of separate magnetic cores arranged in juxtaposition along the both sides of the casing **25**. One of the cores is formed in two parts **39** and **40** (FIG. **11**) terminating in extensions **41** and **42**, respectively, which are bent towards the other core so as to form an angle of 45° with respect to the vertical. Core parts **39** and **40** carry thereon a pair of coils **43** and **44**, respectively, which are series connected for additive connection of induced voltages across the respective coils. The core parts **39** and **40** are connected together at their top by a common yoke **38**. The other core is similarly constructed, and has core parts **45** and **46** both extending from the common yoke **38** and terminating in extensions **47** and **48**, respectively, which are bent towards said one core or extensions **41** and **42** thereof, generally as mentioned previously. Core parts **45** and **46** carry thereon a pair of coils **49** and **50**, respectively, which are connected in series.

In order to facilitate the assembly of the cartridge and at the same time to ensure the maintenance of proper orientation of the core extensions permanently, these core extensions are embedded in a block **51** of resin material in a manner to establish magnetic gaps, between the core extensions **41** and **42** and between the core extensions **47** and **48**, respectively, of predetermined length and orientation. These gaps must be spaced apart sufficiently so that the field in one of them is not substantially influenced by the field in the other. The resin block **51** occupies a large proportion of the space within the casing **25** and is formed in it with a socket **52** in which the stylus assembly is to be placed. The shell **36** which constitutes the magnetic shielding is fitted in the casing **25** so as to enclose the electromagnetic generator and partly cover the resin block **51**.

To fix the stylus assembly at a given position in the body of the cartridge, the knob **28** is formed with an integral, upstanding post **53** which is axially slotted at its top, as shown at **54** (FIG. **9**), so that when the post **53** is plunged into the socket **52**, the spring action afforded by the slotting **54** prevents free removal of the post **53** from the socket **52**. If desired, a suitable latch (not shown) may be provided to lock the stylus assembly in place. However, in any event, the stylus assembly must be detachable by manual withdrawal of the knob **28** from the socket **52**. It is apparent that any conventional registering arrangement such as an axial rib on the post **83** and a mating groove in the socket **52** may be used to locate the stylus assembly in proper orientation upon engaging the knob **28** with the socket **52**. FIG. **8** shows that one of the magnet armatures, **31**, is properly located in this manner within its associated gap defined by the parr of core extensions **41** and **42**, and it is obvious that the other armature **32** is located in a similar manner.

FIG. **9** shows the appearance of the stylus assembly. The knob **28** includes a bottom wall **55** and a pair of side walls **56** and **57**, the bottom wall **55** having the post **83** extending therefrom. On the forward end of the bottom wall **55** there is formed a projecting portion **58** of semi-circular section. On a co-axial line in front of the projecting portion are aligned the damper **34**, the armature support member **33** and the cantilever arm **29**. This Figure clearly shows the disposition of the magnet armatures **31** and **32** in the 45°—45° orientation with respect to the vertical, and also indicates that the side walls **56** and **57** of the knob **28** can be held by fingers to position the stylus assembly on the body, without need to touch the stylus tip **30** or the armatures **31** and **32**.

FIG. **10** is a section showing the stylus assembly in more detail. The cantilever arm **29** comprises a tube of non-magnetic metal material, for example, aluminum. As is known, it is desirable to use a tubular cantilever arm so that it is rigid enough to permit a correct transmission of any oscillation of the stylus tip **30** to the armatures **31** and **32**. The connecting pipe **59** is tightly inserted into the rear end of the tubular cantilever arm and suspension rod **35** is securely bonded to connecting pipe **59**. The suspension rod **35** comprises, for instance, a metal wire, such as a thin piano wire, which exhibits little expansion and contraction. The suspension rod **35** extends a substantial length and rearwardly from the cantilever arm **29**. Another connection pipe **60** is fitted on the suspension rod **35** under compression to grasp it strongly at a position very close to, but spaced from the rear end of the cantilever arm **29**, and is secured to a mounting pipe **61** which extends through the knob **28** and serves at its rear end to fixedly support the rear portion of the support wire **35**. The connection pipe **60** constitutes a primary fixation point for the suspension rod **35**, while the rear end of the mounting pipe **61** constitutes a secondary fixation point therefor, aiding the primary fixation by supplemental fixing action. It will be appreciated that the length of the suspension rod **35** within the mounting pipe **61** may be omitted if the connection pipe **60** provides a full stop action to the wire, and also that the connection pipe **60** may be removed if a complete fixation of the wire can be accomplished by the mounting pipe **61** alone. The clearance left between the connection pipes **59** and **60** is significant in allowing the oscillatory motion of the cantilever arm **29**. It will be readily apparent that when the mounting pipe **61** is secured in position, the suspension rod **35** within the clearance defines the fulcrum for the oscillation of the cantilever arm **29**. The fulcrum may be considered for most arrangements as situated in the middle of the wire portion within the clearance.

It is one of the features of the present cartridge that the magnet armatures are disposed at or adjacent to fulcrum of the vibration system. Hence, the armatures **31** and **32** are mounted on the cantilever arm **29** by means of the armature support member **33** so that they lie in a plane passing through the middle of the clearance, that is, the fulcrum, and perpendicular to the axis of the arm **29**. The support member **33** comprises a synthetic resin such as ABS resin used in resin casing. Preferably, the support member **33** is formed by resin casting with the armatures **31** and **32** partly embedded in the resin moulding so that they maintain the proper orientation permanently. The support member **33** is preferably moulded with an axis bore so that it is an interference fit on the cantilever arm **29**. Part of this axial bore is enlarged, as best shown in FIG. **10**, to allow the free oscillation of the support member **33** without causing any contact with the connection pipe **60**.

The knob is conveniently formed from a synthetic resin and has a hole formed therein extending from the raised portion **58** to the rear end of the knob, this hole receiving the mounting pipe **61**. The knob **28** is provided with a threaded hold extending perpendicularly to said bore and which is engaged by a set screw **62** for holding the pipe **61** in position.

The damper **34** is preferably applied by adhesion to the front end surface of the knob **28**. With the damper **34** in position, the tension in the suspension rod **35** can be freely adjusted by controlling the position of the mounting pipe **61** within the hole of the knob **28**.

While the invention has been described with reference to particular embodiments, it should be understood that various modifications thereof are obvious to those skilled in the art, and hence it is intended that the above description is merely illustrative of, but not limiting the invention.

Having described the invention, what is claimed is:

1. Multichannel pickup cartridge adapted for simultaneous reproduction of multichannel signals from a recorded disk having a groove with two walls each

modulated with respect to each other, comprising a cantilever arm carrying at one end thereof a stylus tip adapted to engage said groove, support means for the cantilever arm including a flexible suspension rod which is secured at its one end to the other end of the arm, extends away from said one end of the arm and anchored at its other end, under tension, to a cartridge body, said suspension rod defining a fulcrum for the cantilever arm at a point intermediate said other end of the arm and the anchorage, a damper of elastic material interposed between the other end of the cantilever arm and the support means, the damper being arranged in surrounding relationship with the suspension rod to thereby allow free movement of the cantilever arm about the fulcrum, a pair of axially magnetized magnet armatures mounted on the arm adjacent to the other end thereof so as to extend in a plane perpendicular to the axis of the arm and in a configuration corresponding to the respective modulated walls of the groove, each of said magnet armatures being arranged to lie in a plane which passes through a point nearest to the said fulcrum, said support means permitting the cantilever arm to transmit any oscillatory motion of the stylus tip said magnet armatures, and an electromagnetic generator with two pairs of axially spaced pole pieces, each pair of said pole pieces being arranged parallel to each magnet armature, said pole pieces forming a pair of independent magnetic gaps in which the magnet armatures are movable, respectively, to change independently magnetic flux in the respective gap in response to a motion of the stylus tip.

2. Multichannel pickup cartridge according to claim 1 in which the pair of magnet armatures are arranged on the same side of the cantilever arm as the stylus tip.

3. Multichannel pickup cartridge according to claim 1, in which the gap length is at right angles to the direction of magnetization of the magnet armature in its neutral position.

4. Multichannel pickup cartridge according to claim 1 in which each of the magnetic gaps is defined by a pair of core portions which are spaced apart in a direction parallel to the axis of the cantilever arm, the pair of core portions which define one of the gaps being on the opposite side of an imaginary vertical plane which includes the axis of the arm from the pair of core portions defining the other gaps.

5. Multichannel pickup cartridge according to claim 1 in which the pair of magnet armatures extend upwardly so as to be on opposite side of the cantilever arm to the direction in which the stylus tip extends.

6. Multichannel pickup cartridge according to claim 2, further including a pair of additional magnet armatures arranged on the same side of the cantilever arm as the stylus tip, each of said additional magnet armatures mounted on the arm adjacent the other end thereof so as to extend in a plane perpendicular to the axis of the arm and in a configuration corresponding to the respective modulated walls of the groove, each of said magnet armatures being arranged to lie in a plane which passes through a point nearest to the said fulcrum,

7. Multichannel pickup cartridge according to claim 1, in which the support means includes a knob to which the other end of the suspension rod is anchored.

8. Multichannel pickup cartridge according to claim 7 in which the knob carries a mounting pipe in which the suspension rod is held.

9. Multichannel pickup cartridge according to claim 8 in which the mounting pipe is provided with a connection pipe which grasps the support wire under tension to provide said anchorage.

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