

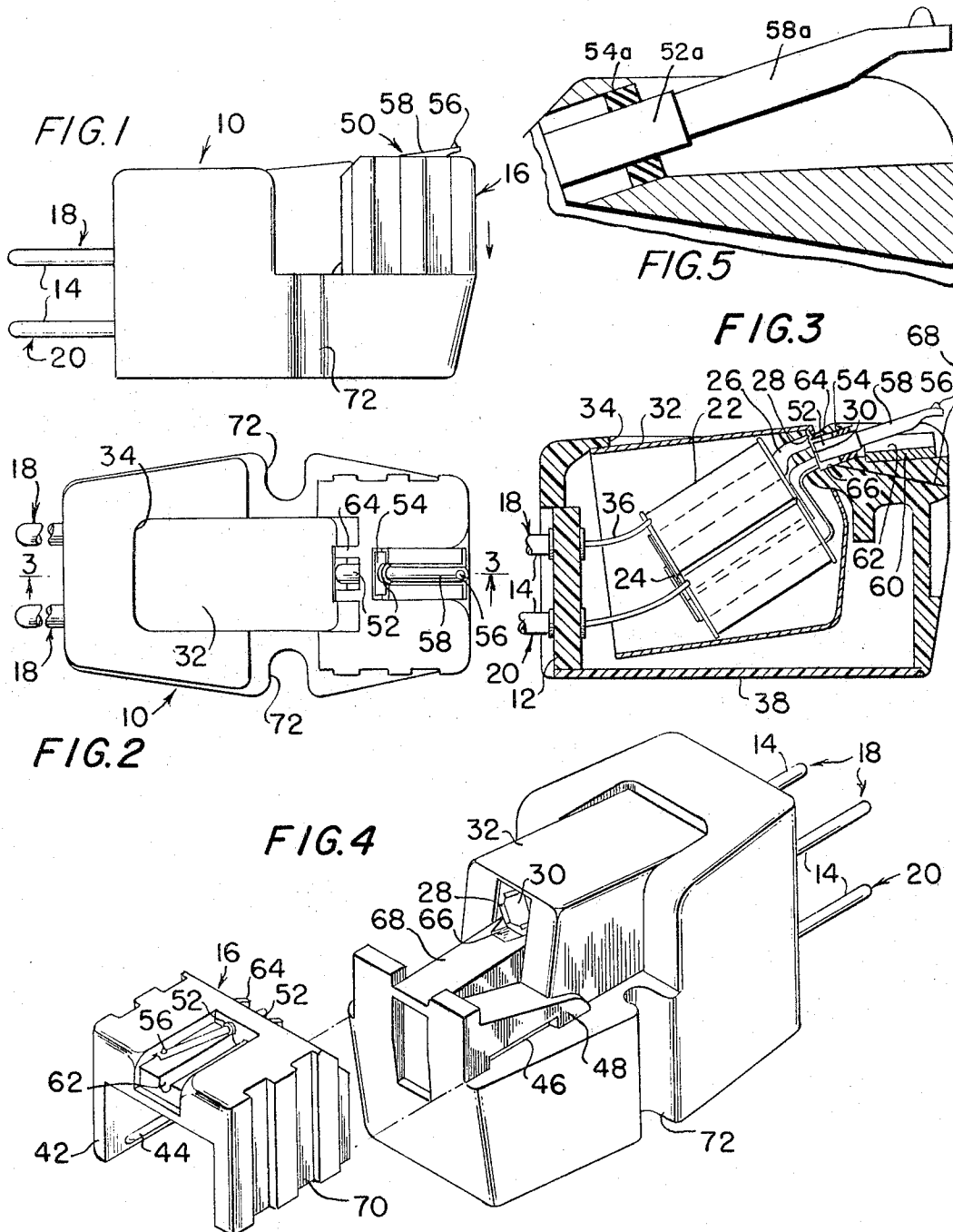
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PHONOGRAPH PICK-UP

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PHONOGRAPH PICK-UP

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This invention relates generally to an electromagnetic phonograph pick-up and more specifically to a stereophonic cartridge, for use with records having sound tracks located on the respective opposite side walls of a single groove. Such stereophonic records, in which the direction of modulation of the two sound tracks is mutually perpendicular, are now quite familiar in the art.

A number of electro-magnetic pick-ups have been designed to play these records, but all of these have fallen short of the potential performance to a greater or lesser extent. It is the object of this invention to devise a pick-up in which these difficulties have been overcome or minimized.

An important object of my invention is to reduce the oscillating mass of the stylus assembly so that any resonance that it may have will occur at a frequency above the range of human hearing. The reduction of this mass will also greatly reduce distortion and wear to the record groove during playing.

Another object of this invention, is to allow the vertical motion of the stylus to closely follow the direction in which the vertical modulation is cut on the record. By this means vertical tracing distortion is virtually eliminated.

A still further object is to provide a replaceable stylus assembly which can be readily and safely handled by the user, and which will accurately locate and align the magnetic armature with the pole pieces.

Other objects are to place the armature outside the pole pieces, allowing the pivoting point of the stylus to be brought closer to the record surface to attain the optimum tracking angle; to eliminate the need for plugging the stylus assembly into a long socket; to permit the moving structure to be exposed facilitating assembly and inspection; to provide a light non-ferrous cantilever, reducing the effective mass at the stylus tip; to provide a stationary permanent magnet for further reducing the mass of the stylus and to provide an externally magnetized armature to obtain a higher level of flux density, thus increasing transducer efficiency and obtaining increased linearity in the output signal.

I accomplish these and other objects and obtain my new results as will be apparent from the phonograph pick-up described in the following specification, particularly pointed out in the claims, and illustrated in the accompanying drawings in which:

FIG. 1 is a side elevation of the pick-up with the stylus mount in position; at the start of its inserting position;

FIG. 2 is a top plan view; and

FIG. 3 is a longitudinal cross-sectioned view; taken in the plane 3—3 of FIG. 2;

FIG. 4 is a perspective view with the stylus mount shown in exploded position.

FIG. 5 is a fragmentary view of the cartridge in section illustrating a magnet armature.

The phonograph pick-up shown in the drawing comprises the housing 10, preferably molded of suitable plastic, at one end of which is mounted a terminal board 12 containing the contact pins 14, and at the other end the stylus mounting 16 which is detachably secured to the housing. Within the housing is contained the electromagnetic circuits, which in the stereo form consists of circuit 18 and the circuit 20.

Each circuit comprises the pair of coils 22 a yoke 24,

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a pole piece 26, with oppositely positioned pole faces 28, molded into the housing. The pole faces are positioned forward and away from the coils. They are spaced apart on the same plane which is defined by the surface 30 of the body, longitudinally parallel to each other with one pair set at 90° to the other.

The two magnetic circuits are contained within the mu-metal can 32, cemented to the inside of the housing, and projecting partly through opening 34 thereof, with a cut-out 35 in the can 32 to permit access to the pole faces. The coils are connected by leads 36 to the contact pins 14, which are rigidly mounted to the terminal board 12, in a suitable manner. A closure 38, is provided for opening 40 in the housing through which the parts are inserted.

The stylus mount 16 is U-shaped, as is shown clearly in FIG. 4, the inside surface of each leg 42, being provided with a small ridge 44 for snap fitting into grooves 46 of the tongue shaped projection 48 of the housing, to position the stylus assembly 50 at the correct angle. The stylus cantilever comprises a tube 52 of magnetically permeable material, such as soft iron forming an armature supported in a suitable elastomeric pivot block 54, made of material such as rubber, for example, and connected to the stylus 56 by a very light but rigid aluminum tube 58 which is flattened to support the stylus.

Adjacent the armature and fixedly positioned underneath the tube 54, to the stylus mount is a permanent magnet 60, which serves to energize the armature. This arrangement allows the stylus to move freely in the desired plane, i.e. at right angles to the direction of the groove and approximately 75° to the record surface. A groove 62 in the magnet provides adequate clearance.

The stylus mount is positioned on the housing 10, with the armature immediately adjacent the face 30 with the armature equally spaced from the two pairs of pole faces 28. The mount is provided with positioning ridges 64 to position the stylus with respect to face 30. Groove 66 is formed into the supporting surface 68 of the housing to permit the armature to be positioned at the correct angle. The mount may then longitudinally be placed with positioning ridges 64 against face 30 and moved in the direction of the arrow shown in FIG. 1, until the ridges 44 snap into the grooves 46 of the housing 10, in the proper position for use.

The lateral grooves 70 on the legs 42 of the stylus mount, provide adequate grips for supporting the fingers during the mounting operation, while grooves 72 are provided for cartridge securing screws, not shown.

In operation, motion imparted by the record to the stylus is transmitted by the aluminum connecting tube to the armature 52. The armature which is positioned in close proximity to and equally spaced from the two pairs of pole faces, will thus induce a change in magnetic flux in one pair of pole pieces, corresponding to the modulation in one grooved wall of the record.

Conversely, motion corresponding to the modulation of the opposite wall of the groove, will cause a change of flux in the second pair of pole faces.

The changes in flux, give rise to an induced voltage in the associated coils, thus producing an electrical output corresponding to the signal recorded in the record groove.

It will be readily apparent that instead of a pair of coils for each magnetic circuit, one coil and one pole face may be used, and that the cartridge may be made solely for monaural use. The cantilever may also be made of magnetic material, as a modification or contain a permanent magnet in place of the armature and the fixed magnet, if desired, although the latter change is not as effective in operation as the construction illustrated in FIGS. 1 to 4. Such a modification is shown in FIG. 5 where the armature-magnet is identified by reference

52a. The other corresponding parts are correspondingly numbered with the letter *a* added.

The pick-up so described thus accomplishes the various objects of the invention. The armature is not contained within the pole pieces as has been the common practice with magnetic stereophonic cartridges up to this time. This allows the pivoting point of the stylus mount to be brought closer to the record surface, thus allowing the optimum vertical tracking angle of 15° to be attained.

The vertical motion of the stylus will thus closely follow the direction in which the vertical modulation is cut on the record. Vertical tracing distortion which can be very severe is thus virtually eliminated.

The stylus mount is provided with a pair of clamping surfaces for pivot mounting to the housing. This is a simpler assembly procedure than the often difficult task of plugging the stylus assembly into a long socket.

Another advantage is the exposure of the various parts of the entire moving stylus structure, thus facilitating assembly and inspection.

The use of a very light nonferrous cantilever arm connecting the stylus to the armature results in a considerable reduction of effective mass at the stylus tip, compared to the usual ferrous cantilever employed by most cartridges using a stationary permanent magnet.

The reduction of mass thus obtained will reduce the oscillating mass of the moving stylus cantilever so that the resonance will occur at a frequency above the range of human hearing and thus will not distort the sound. The lowered mass reduces wear as well on the record.

This arrangement is also superior to the so-called moving magnet cartridge in that for a given armature weight, a more efficient transducer is possible, owing to the higher level of flux density attainable in an externally magnetized armature, thus improving the output signal.

The positioning of the energizing magnet relatively remote from the magnetic circuits and shielding, avoids the possibility of magnetic saturation or near saturation in these parts. Such saturation would lessen the effectiveness of the shielding, lower the efficiency of the transducer and introduce non-linearity in the output signal.

I have thus described my invention, but I desire it understood that it is not confined to the particular forms or uses shown and described, the same being merely illustrative, and that the invention may be carried out in other ways without departing from the spirit of my invention, and therefore I claim broadly the right to employ

all equivalent instrumentalities coming within the scope of the appended claims, and by means of which objects of my invention are obtained and new results accomplished, since the particular embodiment herein shown and described is only one of the many that can be employed to obtain these objects and accomplish these results.

I claim:

1. An electro-magnetic pick-up for a phonograph record comprising a housing containing an electro-magnetic circuit including a coil structure, and terminating in a pole face positioned outside of the coil structure, a stylus mount detachably secured to the outside of said housing, said mount including a moving stylus assembly comprising a cantilever having a stylus and a magnetically charged armature, said cantilever being pivotally secured to the stylus mount so as to move the armature in substantially the plane of said pole face and outside of the coil structure in response to the engagement of the stylus with a groove in the record, and a magnet means supported on the stylus mount for energizing the armature, said magnetic means being positioned external to the coil structure, and being the sole means for energizing the electro-magnetic pick-up.

2. The pick-up of claim 1 in which the magnetic means and the armature constitute a single means.

3. The pick-up of claim 1 wherein a plurality of pole faces are employed, all terminating in a plane substantially tangent to the arc of the moving armature.

4. The pick-up of claim 3, in which the plane of the pole faces is on the external surface of the housing.

5. The pick-up of claim 3 wherein a metal shielding is provided for the coil structure, and the armature and magnetic means are located outside of said metal shielding.

6. The pick-up of claim 1 wherein the sole magnetic means is a magnet fixedly secured to the stylus mount and outside the housing.

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