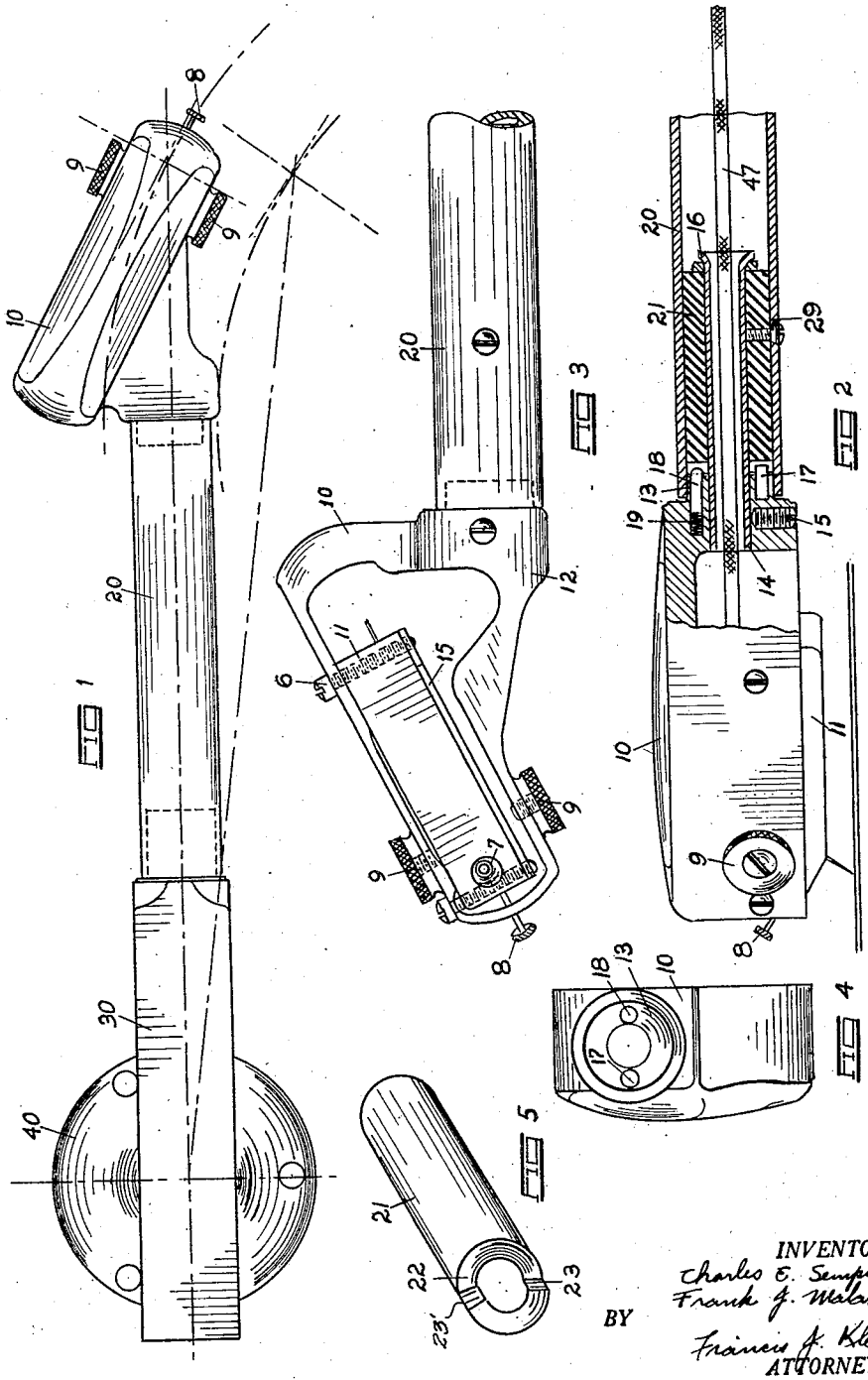
Dec. 5, 1939. C. E. SEMPLE, JR., ET AL 2,182,138

ELECTRIC PHONOGRAPH PICKUP

Filed July 8, 1937 3 Sheets-Sheet 1



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ELECTRIC PHONOGRAPH PICKUP

Filed July 8, 1937 3 Sheets-Sheet 2

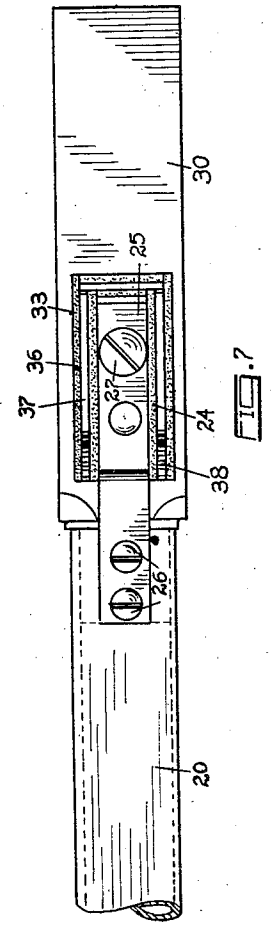

FIG. 7

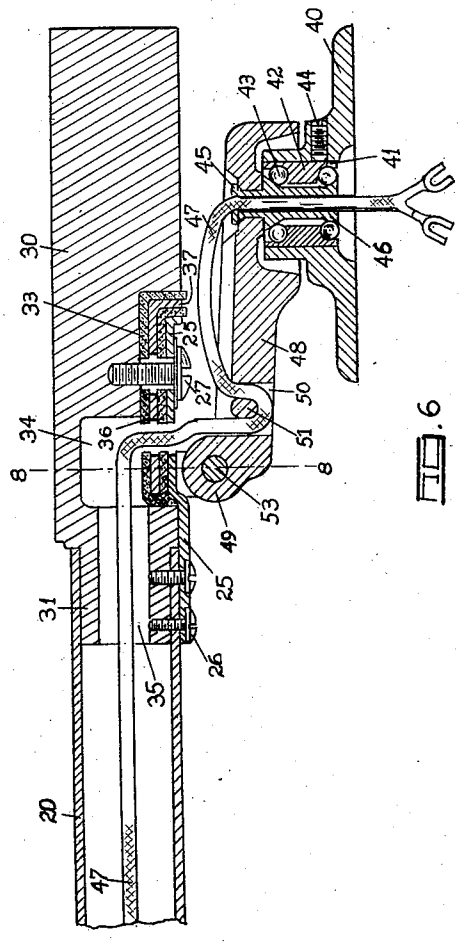

FIG. 6

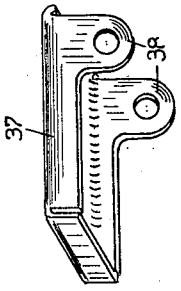

FIG. 9

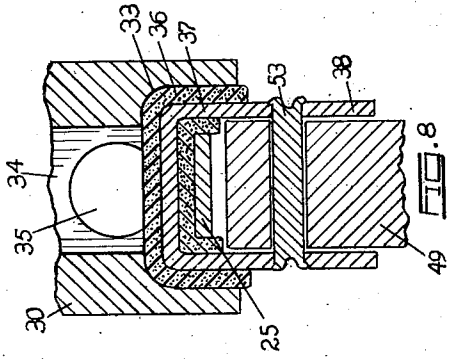

FIG. 8

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ELECTRIC PHONOGRAPH PICKUP

Filed July 8, 1937 3 Sheets-Sheet 3

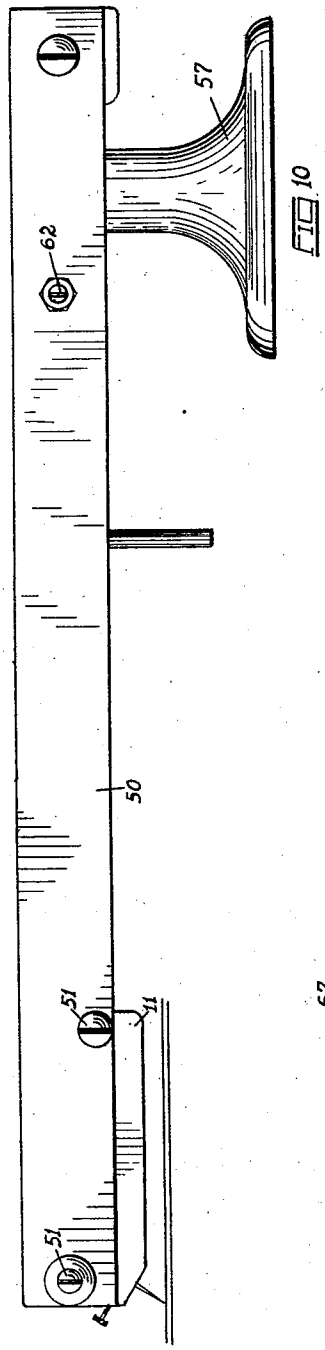

FIG 10

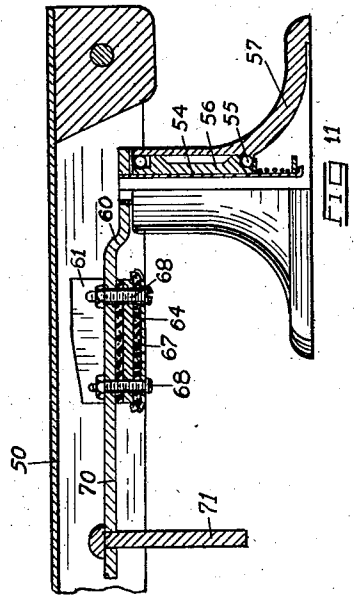

FIG 11

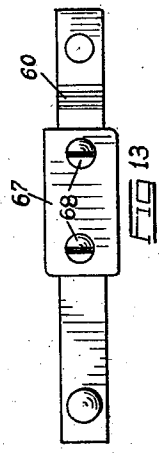

FIG 13

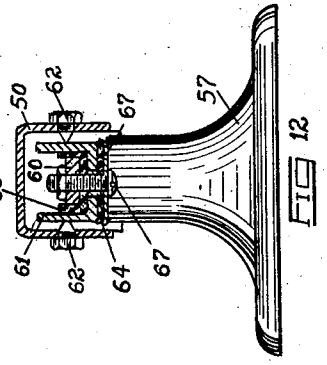

FIG 12

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UNITED STATES PATENT OFFICE

2,182,138

ELECTRIC PHONOGRAPH PICKUP

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Application July 8, 1937, Serial No. 152,550

11 Claims. (Cl. 274—23)

This invention relates to the art of sound reproduction and more particularly to means for operatively supporting the translating device for converting the mechanical impulses caused by the moving record into electrical impulses suitable for use in electrical phonographs. Such supporting means are commonly termed pick-up arms and are so constructed that the stylus or needle of the translating device may rest in the groove of the record and move across the face of the record as the record rotates.

Mechanical pulsations reach the translating device through the stylus or needle, the point of which is reacted on by the undulations of the groove and for purity and fidelity of reproduction extraneous impulses must be kept from the stylus or needle of the translating device. As it is common practice to mount the pick-up arm and the receiver or loudspeaker on the same cabinet structure, extraneous vibrations, in addition to those caused by the natural period of oscillation of the arm structure and by the driving motor, are fed back to the needle from the receiver or loudspeaker and reintroduced to the translating device. As the feed-back vibrations vary in phase and intensity at different frequencies, the reproduction is distorted in volume and tone quality, and as the electrical amplification between the translating device and the loudspeaker is increased, a condition of "feed-back" or oscillation is reached, resulting in a loud, steady, extraneous tone being produced. On this account, the amplification must be set below the feedback point, and the possible useful sound output is thus limited by the energy fed-back through the pickup arm to the needle.

Heretofore various means have been employed to cushion the support for the translating device to prevent transmission of extraneous vibrations to the stylus but such means have only been partially successful. In some instances the cushioning means used allows too great freedom of movement of the arm with a consequent reaction on the translating device. In others "feed-back" is not prevented.

Accordingly, the primary object of this invention is to provide an improved cushioning means for the support for the translating device which will prevent the transmission of extraneous vibrations, restrain the natural periodic vibration of the arm, and eliminate "feed-back".

Another object of the invention is to provide an improved cushioning means for the pick-up arm in which the cushioning effect may be readily altered or adjusted to vary the vibration transmission characteristics of the same and so balance the system against "feed-back".

A further object of the invention is to provide an improved element for the housing and immediate support of the translating device.

Another object is to provide such a support in which the vertical plane of the needle is caused to assume a good average tangency with the curve of the groove of the record as the needle moves across the record and in which the support may be readily rotated to facilitate the insertion and removal of the needle.

A still further object of the invention is to provide improved means to hold the support in a selected rotated position.

These and other objects and advantages of the invention will become apparent from a consideration of the drawings and the following detailed description of preferred embodiments of the invention.

In the drawings:

Figure 1 is a plan view of a pick-up arm constructed in accordance with our invention;

Figure 2 is a side view, partly in section, of the end of the arm;

Figure 3 is a bottom view of the end of the arm;

Figure 4 is an end view of the support for the translating device;

Figure 5 is a perspective view of an element of the locking device;

Figure 6 is a longitudinal cross-section of a portion of the arm and the supporting bracket;

Figure 7 is a bottom view of a portion of the arm;

Figure 8 is an enlarged cross-sectional view taken along the line 8—8 of Figure 6;

Figure 9 is a perspective view of a connecting element;

Figure 10 is a side view of a modified form of arm;

Figures 11 and 12 are sectional views of the arm of Figure 10; and

Figure 13 is a bottom view of the supporting strip and cushioning means.

Referring to the first mentioned embodiment of the invention, illustrated in Figures 1 to 9, inclusive, the arm consists generally of a head 10, a tubular central member 20 and a weighted end member 30. In accordance with usual practice the arm is movable about both horizontal and vertical axes and for this purpose the base 40 which is adapted to be fastened to a suitable surface of the cabinet structure is provided with a vertically extending bore 41 to receive the outer race 42 for

the ball bearings 43. A suitable set screw 44 holds the race in proper position. A hollow shaft 45, having coned portions 46 to engage the bearings, supports the horizontally disposed bracket 48 at its upper end, the bracket being provided with an upstanding lug 49 at its outer or free end with a horizontally disposed bore to receive the pivot pin 53. A slot 50 and a strut 51 is provided in a portion of the bracket to provide anchorage means for the conductor 47.

The weighted end member 30 of the arm consists of a square block of metal having an integral rounded shank 31 to fit within an end of the tubular member 20. An oblong shaped depression 33 is provided on the bottom surface of the member 30 to receive the cushioning and supporting means hereinafter described. A recess 34 communicating with the bore 35 in the shank 31 and with the depression 33 provides a passage for the conductor 47.

Lining each of the bottom and side walls of the depression 33 is the sheet of cushioning material 36, preferably of sponge rubber. Fitting snugly within this lining is the dished member 37. As shown more clearly in Figure 9, the member 37 is provided with integral depending apertured ears 38 which overlie the side edges of the lug 49 and receive the pivot pin 53. A second sheet of cushioning material 24 also preferably of sponge rubber, lines the bottom and side walls of the member 37. An elongated clamping member 25 overlies a portion of the sheet 24 at one end and is rigidly fastened to the shank 31 at its other end by means of the screws 26 passing through aligned apertures in the member 25 and tube 20 and threaded into tapped holes in the shank 31. This arrangement securely fastens the tubular member 20 to the block 30. The sheets 24 and 36, the member 37 and the strip 25 are provided with aligned apertures to receive the shank of the clamping screw 27 which is threaded into a tapped hole in the block. As shown in Figure 6, the opening through member 37 is considerably larger than the diameter of the shank of the screw 27 to avoid contact between these members.

It is thus apparent that the arm is thoroughly cushioned from the bracket 48, there being no metallic connection between the two members. The screw 27 is adjustable to vary the compression of the shock insulating sheets 24 and 36 and thus the vibration transmission characteristics of the assembly may be regulated. Also since the natural periodic movements of the arm are determined by the rigidity of its mounting they may be controlled by altering the compression or density of the cushioning sheets. The disclosed construction permits the placement of the vibration insulation close to the axis of the arm thus eliminating the tendency of the arm to bounce, a condition prevalent in hill and dale systems. We provide large bearing areas of vibration insulating material and we are enabled to use materials not easily molded in secial forms.

The translating device 11, commonly termed a cartridge is housed within the hollow head 10 and is angularly disposed with relation to the longitudinal axis of the arm. The cartridge is preferably of the piezo-electric crystal type but it should be obvious that other types of translating devices may be used. Member 10 is provided with the angularly disposed side portion 12 having a reduced shank 13 fitting within the end of the tubular member 20. A bushing 21 of "Bakelite" or other suitable material is secured within the tube 20 by the screw 29. As shown more clearly in Figure 5, the outer end of the bushing is cut away at 22 for a portion of its periphery to provide a pair of longitudinally extending shoulders, 23 and 23', the shoulder 23 being at right angles with the plane of the end and the shoulder 23' being inclined thereto. A tube 14 secured within a bore in the head 10 by the set screw 15 extends through the bushing 21 and has its end swaged over at 16 to secure the bushing and head together. Spaced from but extending parallel with the axis of the tube 14 are the pins 17 and 18 socketed in recesses in the shank 13. The pin 17 is rigidly mounted but a spring 19 is placed in back of the pin 18 to constantly urge the pin outward.

With the head in operative position both pins are within the cut away portion 22 engaging both shoulders 23 and 23' to hold the head in position. If the head is now rotated to change the needle or for other purposes, the spring pressed pin 18 rides over the inclined shoulder 23' and frictionally engages the end surface of the bushing. The rotation of the head is limited by the engagement of pin 17 with shoulder 23'. Thus any excessive twisting of the conductor 47 is prevented. The frictional engagement of the pin 18 with the end of the bushing holds the head in rotated position while the needle is being changed.

A plate 15 and screws 6 clamp the cartridge 11 to the side wall of the head. The cartridge 11 is provided with a needle receiving socket 7 and a set screw 8 to engage the needle and hold it rigidly in the socket. Thumb and finger engaging members 9 are provided to facilitate rotation of the head.

As shown in Figures 1 and 3 the cartridge and the plane of the needle carried thereby is disposed at an angle to the longitudinal axis of the arm. This arrangement enables the vertical plane of the needle to assume a better average tangency with the curve of the groove of the record, resulting in better reproduction and decrease in wear of the record and needle.

Figures 10 to 13, inclusive, illustrate a modified form of arm in which the rotatable and angular feature of the head is eliminated. The cartridge 11 is held within the inverted channel arm member 50 by the screws 51 passing therethrough. The same method and means of vibration insulation as described above in connection with the first form are applied to the modified device. The vertically extending hollow shaft 54 is rotatably supported by the antifriction bearings 55 housed within the bore 56 of the base 57. A supporting strip 60 is positioned within the channel member 50 between the side walls thereof and has its one end rigidly fastened to the upper end of the hollow shaft 54.

An inverted channel shaped member 61 is positioned within member 50 and pivotally supports said member 50 by means of the pointed screws 62 passing through the side walls of the member 50 and engaging detents in the side walls of member 61. The member 61 fits about the strip 60; a layer 63 of vibration insulating material being interposed therebetween, all as shown in Figure 12. Another layer 64 of vibration insulation is beneath the horizontal wall of the member 61 and plate 67 overlies this layer. A pair of bolts 68 clamp the plate 67, the strip 61 and all intermediate members together. The sheets 63 and 64 are preferably of sponge rubber and their compactness or density may be varied by adjustment of the clamping bolts 68.

If desired the strip 61 may be provided with an extended end 70 to support a downwardly ex-

tending stop pin 71, the purpose of which is well known in the art.

The device of Figures 10 to 13, inclusive, is simple and may be readily and economically manufactured. The cushioning means is effective and the adjustability thereof is particularly desirable. In general the device is well suited for the purpose for which it is intended.

While the invention has been described with reference to specific embodiments, it should be understood that these are illustrative only and that various modifications may be made within the scope of our invention as defined in the subjoined claims.

We claim:

1. In a sound reproducing system, a translating device for converting mechanical impulses into electrical impulses, a support for said translating device, cushioning means comprising a sheet of compressible material between said support and said translating means, and means for varying the compression of said sheet whereby the mechanical vibration transmission characteristics thereof may be controlled.

2. In a sound reproducing system, a translating device, a support therefor comprising a base, an arm swiveled on the base, a bracket having an outer flat surface swiveled on said arm, a carrier for said translating device having a flat surface overlying the outer flat surface of said bracket, compressible vibration dampening material between said surfaces, and means for varying the compression of said material.

3. In a sound reproducing system, a base, an arm swiveled on the base, a bracket having an outer flat surface swiveled on said arm, a generally horizontally disposed elongated member adapted to overlie a record disk, a translating device carried by the outer end of said member, a recess in the bottom surface of said member adapted to receive a portion of said bracket, and a sheet of vibration dampening material positioned between the bottom of said recess and the flat surface of the bracket, and means to clamp said member to said bracket.

4. In a sound reproducing system, a base, an arm swiveled on the base, a bracket swiveled on said arm, a generally horizontally disposed elongated member adapted to overlie a record disk, a translating device carried by the outer end of said member, a recess in the bottom surface of said member adapted to receive a portion of said bracket, a sheet of compressible vibration dampening material between the bottom of said recess and the bracket, and means to vary the compression of the material, said means clamping said member to said bracket.

5. A sound reproducing system comprising an elongated weighted block, a supporting element extending from said block, a translating device on the outer end of said element, said block being provided with a recess in its bottom wall, a bracket partially within said recess, vibration dampening material between the walls of said recess and said bracket, means clamping the block to the bracket, and means supporting said bracket for movement about horizontal and vertical axes.

6. A support for a translating device comprising an inverted channel-shaped member, an upright channel-shaped member pivotally mounted within said first mentioned member, a supporting bar extending longitudinally within both said members but spaced therefrom, vibration dampening material between said bar and said second mentioned member, and a pivot mounting an extended end of said bar for swinging movement about a vertical axis.

7. The structure of claim 6 and a vertically disposed stop pin depending from the other extended end of said bar.

8. A support for a translating device comprising an inverted channel-shaped member, an upright channel-shaped member pivotally mounted within said first mentioned member, a supporting bar extending longitudinally within both said members but spaced therefrom, resilient compressible vibration dampening material between said bar and said second mentioned member, means clamping said bar, material, and said second mentioned member together, said means being operative to vary the compression of said material, and a pivot mounting an extended end of said bar for swinging movement about a vertical axis.

9. In a sound reproducing system, a base, a member swiveled on the base, a bracket having a flat surface portion swiveled on the member, an arm having a flat surface portion adapted to overlie the flat surface portion of the bracket, said arm being adapted to support a translating device at its outer end, a sheet of resilient compressible vibration dampening material between said surface portions, and adjustable means clamping said bracket and arm together.

10. In a sound reproducing system, a translating device for converting mechanical impulses into electrical impulses, a support for said translating device, cushioning means comprising a mass of resilient compressible material interposed between said support and said translating device, and means for varying the compression of said mass whereby the mechanical vibration transmission characteristics thereof may be controlled.

11. In a sound reproducing system, a translating device, a support therefor comprising a base, an arm swiveled on the base, a bracket swiveled on said arm, a carrier for said translating device supported on said bracket, cushioning means between said bracket and said carrier comprising a mass of resilient compressible material, and means for varying the compression of said mass whereby the mechanical vibration transmission characteristics thereof may be controlled.

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