

Oct. 24, 1939.

J. R. BIRD

2,177,239

ELECTRIC PICK-UP FOR SOUND REPRODUCTION

Filed July 29, 1937

2 Sheets-Sheet 1

FIG. 1

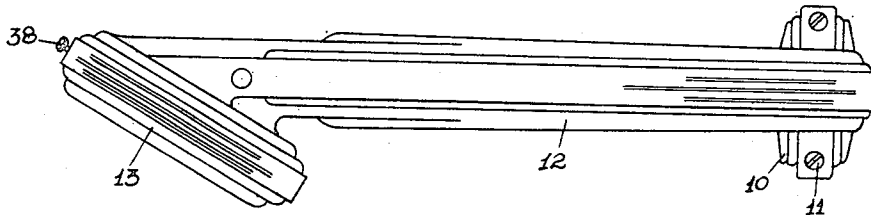


FIG. 2

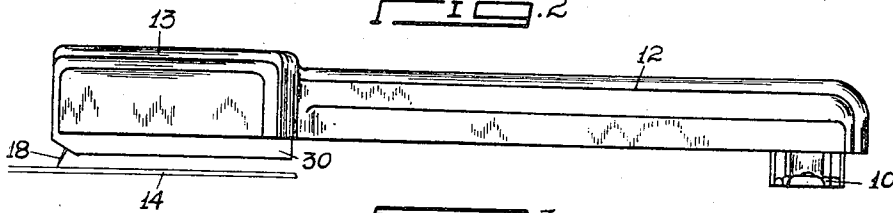


FIG. 3

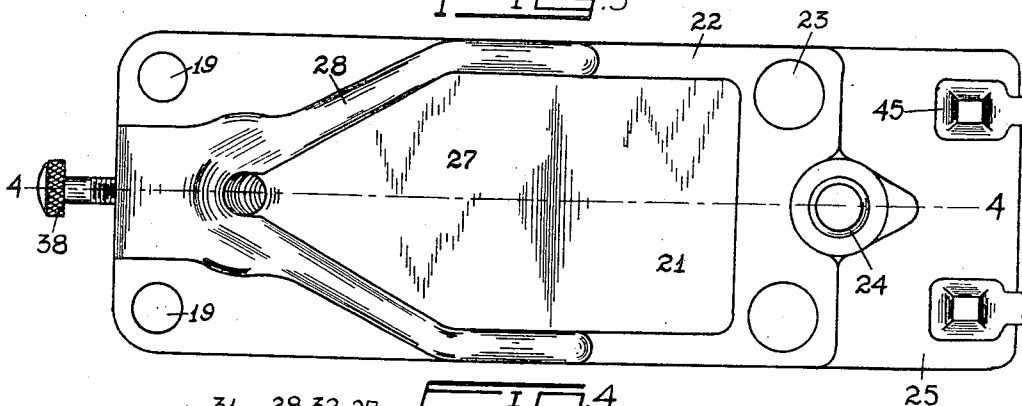
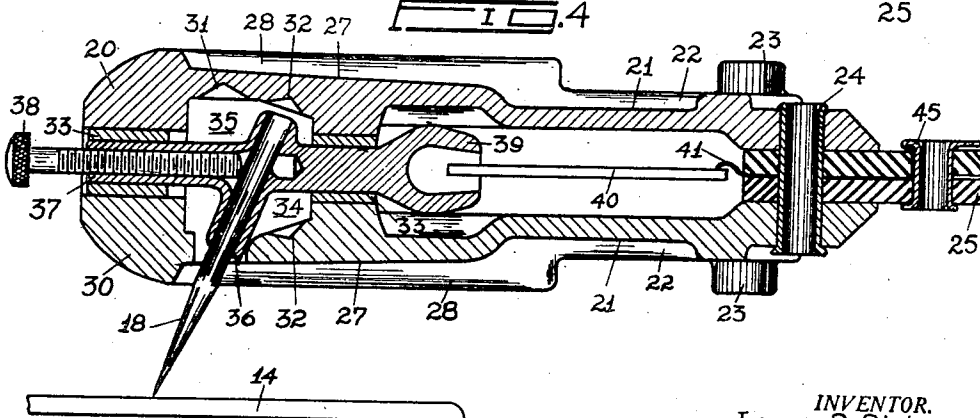


FIG. 4



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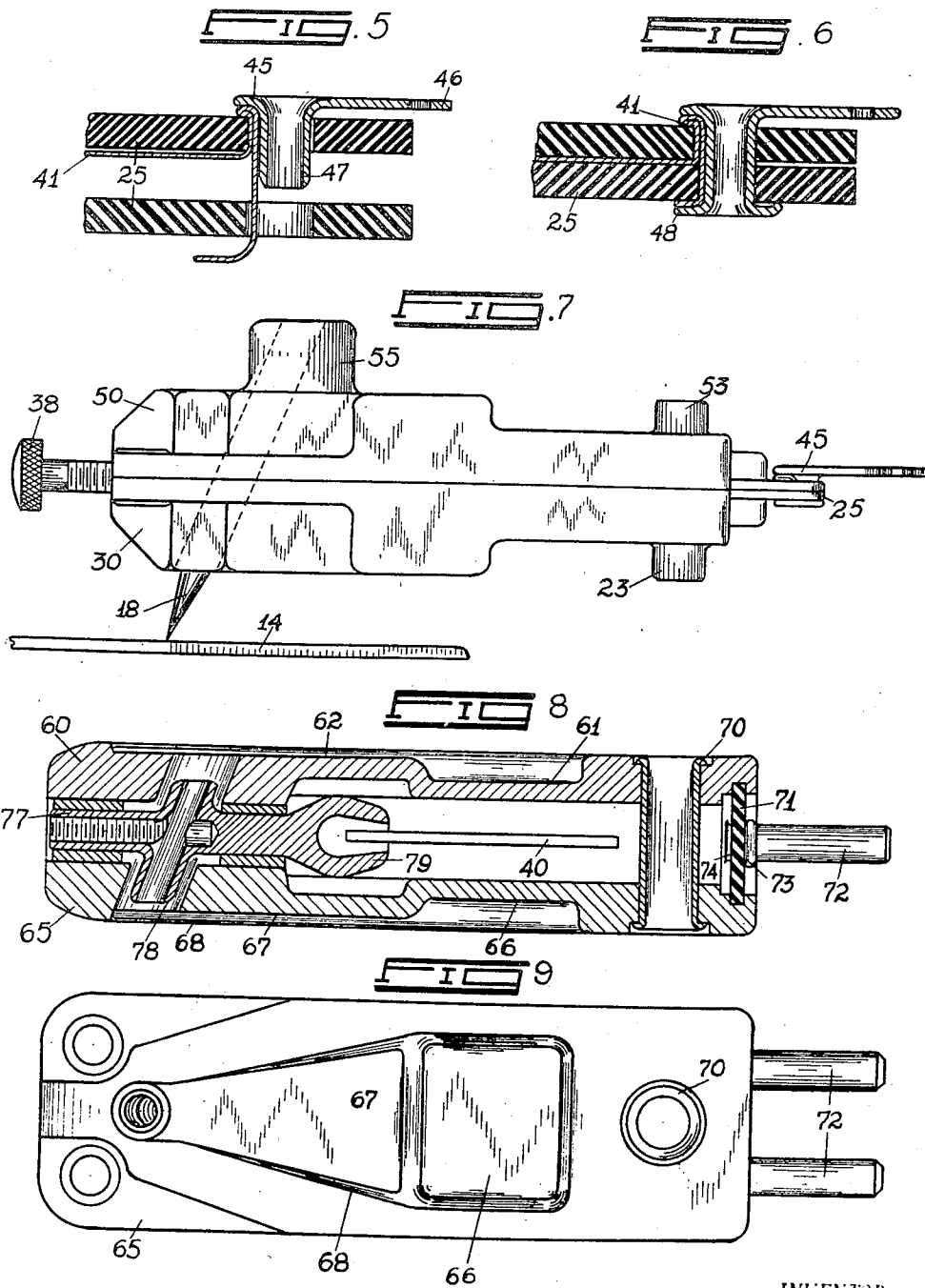
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ELECTRIC PICK-UP FOR SOUND REPRODUCTION

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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ELECTRIC PICK-UP FOR SOUND
REPRODUCTION

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Application July 29, 1937, Serial No. 156,333

14 Claims. (Cl. 179—100.41)

This invention relates to the art of sound repro-
duction from phonograph records and more par-
ticularly to certain improvements in the design
and construction of the translating devices which
convert the mechanical undulations of the record
into electrical impulses suitable for amplification
and reconversion into audible sound energy. The
translating devices, commonly termed "pickup
heads" or, in the case of piezo-electric devices,
"cartridges", consist generally of a unitary as-
sembly having casing means, means to inter-
changeably support the stylus or needle, vibra-
tion responsive means connected with the stylus
or needle for generating electrical impulses or in-
terrupting the even flow of current to produce
the electrical impulses, and suitably insulated ter-
minal connections connected with the electrical
means and adapted to be connected with conduc-
tors leading to the amplifiers.

The translating device is usually mounted ad-
jacent the free end of an arm pivotally supported
on vertical and horizontal pivots positioned ad-
jacent the outer periphery of the turntable upon
which the record disk is rotatably supported. In-
asmuch as the needle must extend downwardly
from the translating device and since the needle
and its receiving bore are of small diameter, con-
siderable difficulty is encountered in inserting the
needle in the lower end of the bore. The diffi-
culty is partially caused by the limited pivotal
movement of the arm about its horizontal pivot
and consequently the inability of the operator to
see the open lower end of the bore. One of the
objects of my invention is to provide improved
means to guide the upper end of the needle into
the needle receiving bore as the needle is being
manipulated by the operator.

Another object of my invention is to so arrange
the guiding surfaces that the vertically held
needle may be moved towards the needle support-
ing means in a direction of travel beginning from
a point considerably removed from the periphery
of the turntable, whereby ample space is provided
for the hand holding the needle.

A further object of the invention is to provide
a casing for the housing and support of the trans-
lating appurtenances which may be economically
manufactured and assembled.

A still further object of the invention is to pro-
vide improved means to support and connect the
electrical terminals.

These and other objects and advantages of the
invention will become apparent from a considera-
tion of the drawings and the following detailed
specification.

In the drawings:

Figures 1 and 2 are top and side views, respec-
tively, of the pivotally mounted arm supporting
the translating unit of my invention;

Figure 3 is a bottom view of the translating
unit constructed in accordance with my inven-
tion;

Figure 4 is a sectional view taken along the line
4—4 of Figure 3;

Figures 5 and 6 are sectional expanded and as-
sembled views, respectively, of the terminal con-
nection;

Figure 7 is a side view of a modified form of
cartridge; and

Figures 8 and 9 are sectional and bottom views,
respectively, of another form of cartridge.

The translating device of Figures 3 and 4 con-
sists generally of a casing having upper and
lower sections 20 and 30, respectively, a combined
needle holder and vibration transmitting member
35, a piezo-electric crystal unit 40, and insulated
terminals 45. Casing sections 20 and 30 are pre-
ferably die cast from zinc and in order to reduce
their cost of manufacture they are substantially
identical and may be struck from the same die.
The sole difference between the sections is that
the lower section is provided with a drilled aper-
ture for the passage of the needle 18 and needle
holding sleeve 36. Drill guiding recesses 31 and
32 are cast on the inner surfaces of all the sections
and those sections which form the lower portions
of the casings are then drilled as shown, the re-
cesses 31 serving as a starting guide for the drill.
Thus only one set of dies is required and the
cost of manufacturing the casings is kept to a
minimum.

As shown, the casing sections are substantially
rectangular in shape and are each provided with
a depressed portion 21 adjacent one end thereof.
A less depressed portion 27 communicates with
the portion 21 and extends longitudinally towards
the other end of the cartridge. A ridge 22 sur-
rounds the rear end and sides of the portion 21
and a higher ridge 28 connects with the same and
surrounds the portion 27. The depressed portion
27 is triangular in shape, decreasing in width
towards the end of the section and in the case
of the lower section, the aperture for the re-
ception of the needle is located at the apex of the
triangle. When the needle to be inserted in the
device is held generally vertically and the upper
blunt end thereof is placed underneath the
cartridge, the upper end will contact either sur-
face 21 or 27 and if the needle be then drawn for-
wardly it will be guided to the apex of the triangle

by the ridges 22 and 28 where it will slip upwardly into the needle holding means. Thus the insertion of the needle is rendered less difficult.

Each of the sections 20—30 is provided with a pair of inner, spaced, longitudinally aligned semi-cylindrical surfaces which form a pair of spaced aligned cylindrical bores when the sections are assembled. The bores are lined with the cylindrical bushings 33, preferably of rubber, which receive and support the member 35 for holding the needle and transmitting the torsional vibration to the crystal unit 40. Member 35 has an inclined downwardly extending tubular element 36 for the reception of the upper portion of the needle, an internally threaded tubular portion 37 extending forwardly through the outer cylindrical bore, and a rearwardly extending portion 34 journaled in the inner bore. A screw 38 having a knurled head is threaded into the tube 37 to engage and secure the needle 18. The rear portion 39 of the shank 34 is enlarged, hollowed as shown and is provided with a pair of diametrically opposed slots to receive the outer end of the crystal unit 40. Crystal unit 40 is of the multiple-plate flexing type which in operation flexes torsionally and consists of two properly oriented crystalline plates of Rochelle salt or the like. The ends of the plates opposite the driver 39 are rigidly held in any suitable manner. A thin ribbon conductor 41 connects each of the two plates of the unit 40 with its corresponding terminal 45.

Laterally disposed undulations in the groove of the phonograph record are picked up by the needle 18 causing the shank 34 and driver 39 to vibrate through small angles to impart proportional twisting movement to the crystal unit 40, causing unit 40 to generate impulses proportional in intensity and equal in frequency to the undulations in the record groove as is well understood in the art.

A pair of superimposed plates of insulating material 25 extends outwardly from the rear of the cartridge, being clamped in position by the rivet 24 which also holds the rear portions of the casing sections together. The ribbon conductors 41 pass outwardly between the plates 25 and are connected to the terminals 45 in the manner shown in Figures 5 and 6. As shown, the outer ends of the upper and lower plates 25 are provided with aligned apertures for the reception of the square shanks 47 of the terminals. Each ribbon conductor 41 extends upwardly between the wall of the aperture of the upper plate and is folded over underneath the upper flange of the shank from where it extends downwardly between the shanks and walls of the apertures. Its end is clamped under the swaged over lower end 48 of the shank 47. Terminal 45 is provided with an eyed or hooked end 46 to which the lead-in wires may be soldered. It should be observed, however, that no solder is required to connect the ribbon conductors 41 with the terminal. Consequently less time is required for the assembling of the unit.

The forward end of the cartridge sections 20 and 30 are fastened together by the rivets 19 and any suitable means may be employed to secure the cartridge to the pivotally mounted arm. The casing sections are provided with a pair of rearwardly positioned spacing bosses to engage a surface of the arm to stabilize and level the cartridge.

In Figures 1 and 2 I have illustrated an arm 12 pivotally mounted for horizontal and vertical movement on the base 10 which is secured to the

cabinet structure by the screws 11. The outer end of the arm 12 is provided with an angularly offset head 13 adapted to receive and support the cartridge above described. Base 10 is mounted to the right of the phonograph turntable as viewed from the front of the assembled reproduction apparatus and therefore the longitudinal axis of the head 13 and cartridge extends outwardly from the turntable as well as rearwardly. Thus when a needle is to be inserted in the cartridge, the turntable does not interfere with the movement of the operator's hand.

The cartridges disclosed are also readily adaptable to installations where the needles are fed into the needle holder from the upper surface of the cartridge or arm. Such an arrangement is shown in United States Patent No. 1,835,073 and is commonly termed a "top loading pick-up". Figures 7 and 8 of this application illustrate the manner in which the cartridges may be made adaptable for such use. It is only necessary to provide a bore entirely through the two sections of the cartridge casing. For example, the device of Figure 4 may be so prepared merely by drilling through the upper casing section 20 at the guide 32.

In certain top loading installations it is desirable to provide a boss on the upper surface of the cartridge which boss may extend through an aperture in the arm or cooperate in other manner with a needle feeding device positioned on the arm and Figure 7 illustrates such a boss. This is provided for in the design and construction of the forming dies by drilling a hole in the die in the form and in the position of the boss. If the boss 55 is desired the hole is left open but if the boss is not desired, a plug is inserted in the hole to prevent the entry of the metal. The boss and upper cartridge section is drilled as shown in dotted lines, the recess 32 being used as a starting guide. If a covered arm as shown in Figures 1 and 2 is used, an aperture is provided for the passage of the boss.

Figures 8 and 9 illustrate a modified form of cartridge in which the divergency of the guiding ridges 58, which correspond to the guiding ridges 23 of Figure 3, is less pronounced. The operation and use of the cartridge and guiding surfaces is, however, precisely the same. The terminals consist of metallic tubular members 72 having integral bulbous portions 73 adapted to engage the outer side of the insulating plate 71 and are swaged over at their inner ends to engage the inner side of the plate. As shown the edges of the plate 71 are securely held in grooves formed in the casing members 60 and 65, the rivet 70 holding the rear end of the members in assembled relation. The elements 77, 78 and 79 of the vibration transmitting unit correspond, respectively, to the elements 37, 36 and 39 of Figure 4.

While I have specifically shown the needle guiding surfaces as being applied on the cartridge, it should be understood that the guiding surfaces may be arranged on the supporting arm or be formed on a separate member fastened to the arm or cartridge. Also the invention should not be limited to the illustrated form and direction of the guiding surface. These and other changes in the specific form of my invention, as herein disclosed, may obviously be made without departing from the spirit or scope of my invention.

What I claim is:

1. In a sound reproducing system, a unitary translating device comprising a casing, means in

said casing to convert mechanical pulsations into electrical pulsations, means in said casing to support and detachably secure a record engaging needle, means mechanically connecting said first and second mentioned means, a pivotally mounted arm supporting said device in a dependent position in operative relation to the record, and divergently extending raised surfaces on the lower surface of said casing adapted to guide said needle toward said supporting and securing means upon insertion of the needle, the medial line of said divergently extending surfaces extending angularly with respect to the longitudinal axis of said arm.

2. In a sound reproducing system, a pivotally mounted arm having means adjacent its outer end to detachably hold a depending record engaging needle, and divergent guiding surfaces carried with said arm adapted to guide the movement of said needle in the process of its insertion toward the receiving portion of said holding means, the medial line of said divergent surfaces extending angularly with respect to the longitudinal axis of said arm.

3. A unitary translating device for a sound reproducing system comprising substantially identical upper and lower preformed casing sections, each of said sections having a plate-like wall, an integral peripheral flange extending outwardly from one face of said wall at the edges thereof, a strut spanning the cup-like space created by the flange, and axially aligned semi-cylindrical bearing surfaces in said strut and one reach of said flange whereby spaced axially aligned cylindrical bearing surfaces are provided when the upper and lower sections are assembled, a vibration transmission member journaled in said bearing surfaces, a translating element within said flanges and connected with said member, said member having means to engage a record engaging needle, and an aperture through the lower casing section for the passage of the needle.

4. A casing for a unitary translating device comprising substantially identical upper and lower casing sections each provided with a pair of identically positioned longitudinally spaced inner depressions forming drill guiding means, the upper section being provided with an upwardly extending boss opposite the upper wall from the rear depression of the upper casing section, aligned inclined apertures drilled through the lower casing section, the upper wall of the upper casing section and the boss, the rear depression of the upper section and the forward depression of the lower section forming the guides for the drill.

5. A unitary translating device comprising upper and lower casing sections, means within said casing to convert mechanical pulsations into electrical pulsations, a pair of electrical conductors leading from said means, a pair of superimposed insulating plates clamped between the side walls of said section and being provided with aligned apertures, said conductors passing outwardly between said plates and up and downwardly through said apertures, and terminals having rivet portions adapted to be rigidly secured in said apertures whereby said conductors may be rigidly held in contact with said terminals.

6. A unitary translating device comprising upper and lower casing sections each having a pair of spaced aligned semi-cylindrical bearing surfaces forming a pair of spaced axially aligned cylindrical bearing surfaces when said sections are assembled, a vibration transmission member journaled in said cylindrical bearing surfaces,

stylus holding means on said vibration transmission member, said means being arranged to allow insertion of said stylus from the end opposite to that from which said stylus projects when in operation, and axially aligned bores through said casing sections for the passage of said stylus.

7. In a sound reproducing system, a casing, means in said casing to support and detachably secure a record engaging needle, said casing having a substantially flat bottom surface, an aperture in said surface adjacent the receiving end of said means, said surface being provided with a raised rib extending about the periphery thereof, opposite sides of said rib converging about said aperture whereby a triangular shaped needle confining area having said aperture at its apex is provided to guide said needle into said aperture and said means.

8. In a sound reproducing system, a casing, means in said casing to support and detachably secure a record engaging needle, said casing comprising a substantially flat bottom surface having a triangularly shaped portion, an aperture in said surface at the apex of said triangular portion, said aperture being adjacent the receiving end of said means, and a raised needle confining surface extending about the periphery of said first mentioned surface whereby the butt end of a needle pressed against said surface will be guided into said aperture and said means.

9. In a sound translating device, the combination of means to support and detachably secure a record engaging needle, means to guide the butt end of the record engaging needle into said first mentioned means comprising a substantially triangularly-shaped flat surface so disposed about the first mentioned means that the first mentioned means is substantially at the apex thereof, and a raised surface extending along the sides of said flat surface adjacent said first mentioned means.

10. In a sound translating device, the combination of means to support and detachably secure a record engaging needle, a pivotally mounted arm supporting said means in a dependent position in operative relation to the record, and means to guide the butt end of the needle into said first mentioned means comprising a generally horizontal lower flat surface, a pair of divergently extending raised surfaces on said lower surface, said first mentioned means being positioned substantially at the apex of said divergently extending raised surfaces.

11. In a sound translating device, the combination of means to support and detachably secure a record engaging needle, a pivotally mounted arm supporting said means in a dependent position in operative relation to the record, means to guide the butt end of the needle into said first mentioned means comprising a pair of divergently extending raised surfaces extending outwardly from said first mentioned means.

12. A casing for a unitary translating device comprising upper and lower casing sections, a boss extending upwardly from the upper surface of the upper casing section, and aligned inclined apertures drilled through the lower casing section, the upper wall of the upper casing section and the boss for the passage therethrough of a record engaging needle.

13. A unitary translating device comprising a casing, means within said casing to support and detachably secure a record engaging needle, a boss extending upwardly from the upper wall of

said casing, and aligned apertures drilled through the top and bottom walls of said casing and said boss for the passage therethrough of a record engaging needle.

- 5 14. A unitary translating device comprising a casing having spaced axially aligned bearing surfaces for the support of a stylus holding mem-

ber, said member being arranged to allow insertion of the stylus from the end opposite to that from which said stylus projects when in operation, and axially aligned bores through the walls of said casing for the passage of said stylus.

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