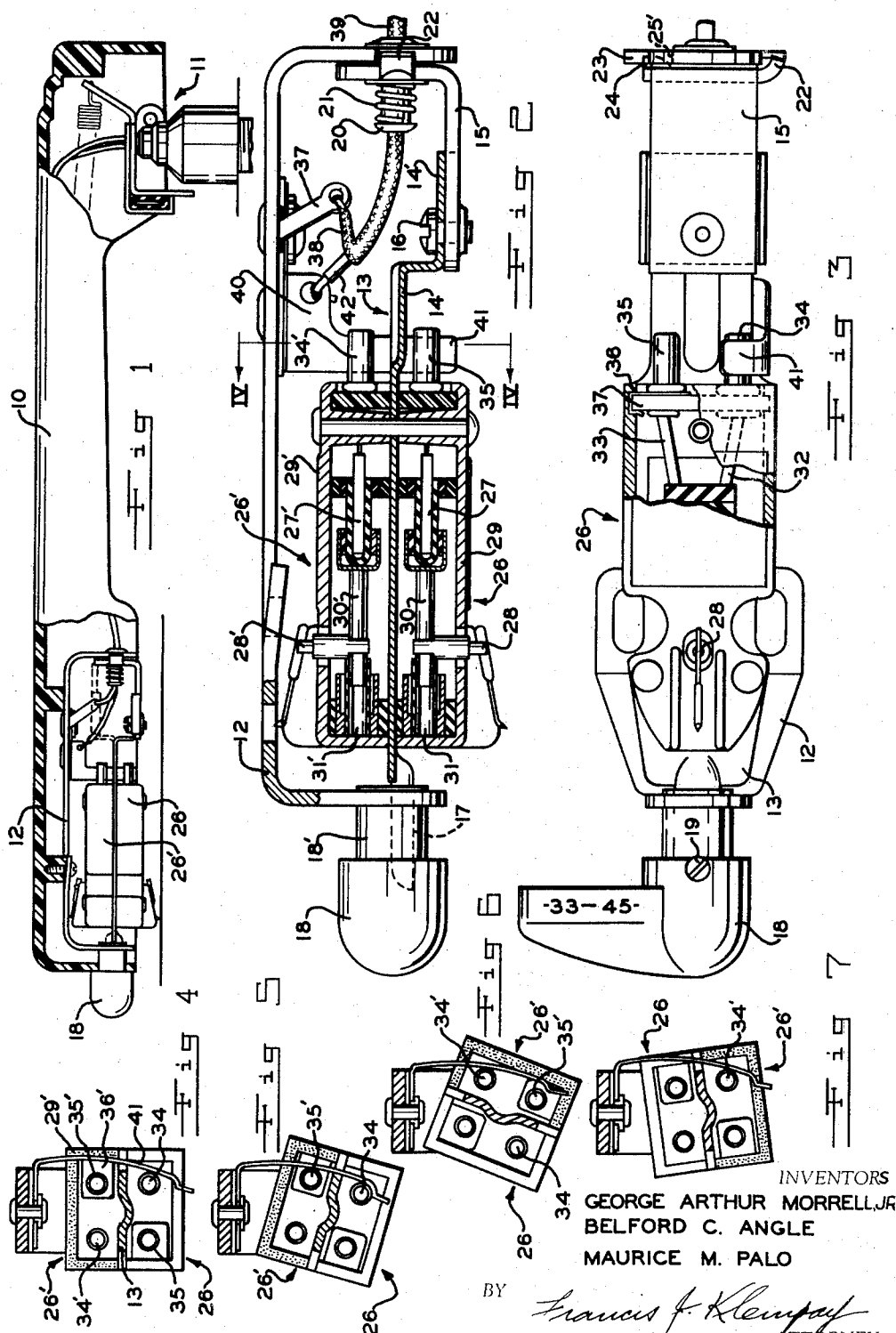


Oct. 14, 1958

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DUAL PICK-UP CARTRIDGE ASSEMBLY
FOR PHONOGRAPH TONE ARMS
Filed March 23, 1953

2,856,465



2,856,465

DUAL PICK-UP CARTRIDGE ASSEMBLY FOR
PHONOGRAPH TONE ARMS

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Application March 23, 1953, Serial No. 343,902

11 Claims. (Cl. 179—100.41)

The present invention relates to pickup cartridge assemblies of the type employed in phonograph apparatus, and more particularly to certain improvements in pickup cartridge assemblies of the type having a plurality of styli for selective use in either standard or so-called micro-groove recording systems.

An object of the present invention is to provide a novel pickup cartridge of the type having selectively usable record-engaging styli wherein each of the plurality of styli is associated with a separate crystal element. Heretofore, in apparatus of this same general type it has been common practice to employ a plurality of record-engaging styli for selective use in the various recording systems, each of which styli was provided with a driving connection with a common crystal element. This arrangement, while having certain practical advantages, has certain inherent disadvantages which we eliminate by our invention. For example, where a single common crystal element is utilized in the pickup assembly the output characteristics of the crystal must be such as to transmit a satisfactory response when in use in either the standard or micro-groove recording systems. And to this end the crystal response is necessarily less than optimum for each system individually. Also, where a common crystal element is associated with a plurality of styli, only one of which is in use at any given time, the idle stylus or styli tend to vibrate in sympathy with the oscillations of the stylus in use, causing distortions and other undesirable output responses.

Another object of the invention resides in the provision of an improved multiple styli phonograph pickup assembly wherein each of the styli is associated with a separate crystal element and wherein each of the pickup units, including a crystal element and a driving stylus therefor, in both electrically and mechanically independent of the other pickup unit or units. The resulting arrangement, as will appear, is such that each individual pickup unit may be specifically designed for use in a particular recording system, and that any unit in use is entirely free from any undesirable influence, either of a mechanical or electrical nature, of the other pickup unit or units not in use at that time.

Another object of the invention resides in the provision in a pickup cartridge assembly of the type characterized above of a novel and simplified arrangement for automatically switching electrical circuit connections from one pickup unit to another upon manipulation of the assembly to present an idle stylus in record-engaging position. In this regard it will be understood that pickup cartridge assemblies of this nature are commonly used in connection with suitable amplifying means, comprising one or more vacuum tube discharge devices, and the crystal element of the unit in use is generally connected in series with the control grid circuit of at least one of such discharge devices. Thus, the present invention seeks to provide a novel and simple arrangement, operative upon manipulation of the pickup cartridge assembly, to disconnect one pickup unit from the amplifying system used in

connection therewith and to connect a second pickup unit into such system.

In furtherance of the above object, it is an additional and more specific object of this invention to provide a pickup cartridge assembly of the type contemplated, having a switching arrangement of the type described above, wherein the switching arrangement is such that at no time during manipulation of the cartridge assembly to present a new unit in record-engaging position is the above-mentioned control grid circuit of the amplifying system in an open condition. Thus, it has been found that whenever the pickup circuit of an electronic amplifying system is fully opened an undesirable and unpleasant hum is emitted from the amplifying system. And this feature is wholly eliminated by the use with such electronic amplifying systems of the cartridge assembly of our invention as will hereafter become apparent.

Yet another object of the present invention resides in certain specific improvements in the mechanical structure of multiple unit pickup cartridge assemblies whereby the same are more easily and economically manufactured and assembled and readily installed in conventional phonographic apparatus.

The above and other objects and advantages of the invention will become apparent upon full consideration of the following detailed specification and accompanying drawing wherein is illustrated a certain preferred embodiment of our invention.

In the drawing:

Figure 1 is a side elevation, partly in section of a phonograph tone arm assembly wherein is incorporated a pickup cartridge assembly constructed in accordance with the teachings of our invention;

Figure 2 is an enlarged view, partly in section, of the pickup cartridge assembly shown in Figure 1;

Figure 3 is a bottom plan view, partly in section, of the assembly of Figure 2; and

Figures 4-7 are section views, taken along line IV-IV of Figure 2, showing the cartridge assembly of our invention in various sequential rotative positions during manipulation of the assembly to present a new stylus in record-engaging position.

Referring now to the drawing, and initially to Figure 1 thereof, the reference numeral 10 identifies a tone arm of the type conventionally employed in phonograph reproducing apparatus. The arm 10 is pivotally mounted at one end 11 for universal movement and mounts at its outer free end a pickup cartridge assembly, which, in the present instance, forms the subject matter of this invention.

As illustrated in Figure 2, the cartridge assembly comprises an inverted U-shaped mounting bracket 12 which is stamped or otherwise formed of metal and which is provided at each end with axially aligned bores or openings which serve, in a manner to be hereafter more fully described, as a rotatable mounting for a plurality of pickup units. Journalled in the aforementioned axially aligned bores is a carrier member 13 comprising a forward portion 14 which is substantially flat but offset somewhat at its back extremity 14' and a rear portion 15 which is generally L-shaped and arranged to underlie the offset portion 14'. In the preferred embodiment of the invention the parts 14 and 15 of the carrier member are secured rigidly together by means of a suitable bolt 16.

For journaling the carrier 13 at its forward end the part 14 is provided with a forwardly extending tongue 17 which is adapted to be received in a suitable control knob 18. The knob 18 is preferably provided with a cylindrical shank portion 18' which is received in a complementary opening in the forward end of the mounting bracket 12 so that the knob and bracket, in assembled

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relation, serve to journal the forward end of the carrier 13. Where necessary or desirable the knob 18 may be secured to the forwardly extending tongue by means of a suitable set screw 19 which is threadedly received in the knob 18.

To journal the back end of the carrier 13 we have provided an elongated hollow rivet 20 which is received in aligned openings in the mounting bracket 12 and the L-shaped part 15 of the carrier 13. And in accordance with the preferred construction, a compressible coil spring 21 is provided which acts between the front head of the rivet 20 and the L-shaped part 15 whereby to urge the last mentioned part rearwardly against the downwardly extending rear leg of the mounting bracket 12. Also in accordance with the preferred construction the L-shaped part 15 is provided with a lug 22 which is adapted to contact one or the other of two abutments 23 formed in the mounting bracket 12 so that positive stop means is provided to assist in positioning the carrier 13 in one or the other of two operative positions. Diametrically opposite the lug 22 on the part 15 is an indented portion 24 which is adapted to be received in one of two diametrically opposed openings 25 in the mounting bracket whenever the lug 22 contacts one of the abutments 23 so that detent-type holding means is provided to retain the carrier 13 in any preset operative position. And it will be understood that upon rotation of the carrier from one operative position to another the detent means 24—25 is released by a longitudinally forward sliding movement of the carrier 13 against the restraining action of the spring 21, the carrier being returned longitudinally rearward upon subsequent engagement of the detent means in another operative position.

In accordance with the teachings of the invention we have secured to opposite sides of the forward portion of the carrier member 13 a pair of pickup cartridge units 26 and 26'. Both of the cartridge units 26 and 26' are substantially identical in construction, except as to certain specific differences to be hereafter pointed out, and therefore elements of one of the units will be identified by means of primed counterparts of reference numerals used in identifying corresponding elements of the other unit.

In the preferred embodiment of the invention each cartridge 26 comprises a casing 29 of aluminum, for example, which houses a conventional piezo-electric crystal element 27 and a driving member 30 therefor. Rigidly connecting the driving member 30 is a stylus and chuck assembly 28 which is preferably constructed in accordance with the teachings of U. S. Patent 2,601,988. In accordance with usual practice the crystal element 27 is firmly secured at one end to the casing 29 and is engaged at the other end by the driving rod 30 which is rotatably journaled at its forward end as indicated at 31. The arrangement is such that the various undulations of a phonograph record may be transmitted through the stylus and chuck assembly 28 and driving member 30 to flex the crystal element 27 accordingly. And as the crystal 27 is thus flexed, varying electrical potentials are generated therein which may be suitably amplified and reproduced in the form of an audible sound.

To transmit electrical signals generated within the crystal element 27 there are conventionally provided suitable take-off leads 32 and 33 which connect opposite terminals of the crystal element 27 and which, in accordance with the teachings of our present invention, are also connected to suitable terminal pins 34 and 35 which extend rearwardly of the crystal unit. Also in accordance with the teachings of the invention the lead 33 is grounded to the electrically conductive aluminum cartridge casing 29 by means of a length of conductive foil 36 which is compressed between the casing 29 and a non-conductive mounting plate 37 to which the terminal pins 34 and 35 are secured. And, as will be readily understood, the lead 33 and terminal pin 35, being grounded to the cas-

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ing 29, are also grounded through the metal carrier member 13 to the U-shaped mounting bracket 12.

Rigidly secured to the mounting bracket 12, in current conductive relation thereto, is a terminal lug 37 to which is connected, by soldering for example, the ground wire 38 of a suitable conductor cable 39 which is passed coaxially through the hollow rivet 20. Also rigidly secured to the mounting bracket 12, but in insulated relation thereto is a terminal lug 40 which has integrally depending therefrom a contact spring 41. And, in accordance with the teachings of the invention the lower end portion of the contact spring 41 normally makes electrical contact with the lower adjacent terminal pin 34 (see Figure 4) while the upper portion of the spring is spaced slightly from the upper adjacent terminal pin 35' which, as illustrated, is grounded to the casing 29'.

Soldered or otherwise connected to the terminal lug 40 is a conductor 42 of the cable 39 which may be connected in a grid circuit of a suitable electronic amplifying device, not shown.

Thus, it will be observed that the lower crystal element 27 is connected in series with the ground conductor 38, through lug 37, mounting bracket 12, carrier 13, casing 29, foil 33 and terminal pin 35, and with the conductor 42 through lug 40, spring 41 and terminal pin 34.

As heretofore mentioned it is desirable to maintain a closed circuit with the amplifying device at all times, including the interval during which the cartridge assembly is rotated to present a new stylus in record-engaging position. This is accomplished in the present invention by a novel orientation and use of the terminal pins 34 and 35 and contact spring 41 as may be best observed in Figures 4-7 of the drawing.

In Figure 4 our apparatus is illustrated in a first normal operating position wherein the cartridge unit 26 is disposed below, and the cartridge unit 26' disposed above the carrier 13, the stylus assembly 28 being in record engaging position with the apparatus thus oriented. The contact spring 41, in Figure 4, is in contact with the terminal pin 34 so that an electrical circuit is completed through the spring and through the carrier 31 to the amplifying device, not shown.

To rotate the cartridge assembly to present a new stylus in record engaging position the control knob 18 is rotated in, for example, a counterclockwise direction, causing the carrier 13 and related assembly to rotate in a clockwise direction as viewed in Figures 4-7.

Figure 5 illustrates the first sequential step in the rotation of the cartridge assembly through an arc of 180° to present a new stylus in operative position, and it will be observed therein that during rotation of the assembly through this first step the lower terminal pin 34 remains in contact with the spring 41, maintaining the crystal element 27 in the amplifying circuit, while the grounded upper pin 35' is moved in a lateral direction into contact with the spring 41. In accordance with the teachings of the invention, the spring 41 and terminal pins 34 and 35' are so oriented that the pin 35' is moved into contact with the spring 41 before the pin 34 is moved out of contact so that at no time is there an open circuit between the rotatable assembly and the spring 41.

In the preferred embodiment of the invention the terminal pin 35' is grounded to the casing 29' by means of foil lead 36', and it will be apparent therefore that upon contact of the pin 35' with the spring 41 a direct circuit is established between ground and the spring, neither crystal 27 nor 27' being in circuit at such time.

Upon continued rotative movement of the cartridge units the terminal pin 34', connecting the previously idle crystal element 27', is moved into contact with the spring 41. And in accordance with the teachings of the invention the grounded terminal pin 35' remains in contact with the spring 41 until contact is initially established

between the spring and terminal pin 34' so that an open circuit condition never exists.

After contact is established between the pin 34' and the spring 41 the assembly is rotated further until the stop lug 22 contacts one of the abutments 23, whereupon the detent 24—25 engages and the assembly is ready for use with a new stylus in record-engaging relation.

To reset the apparatus to its initial operating condition, the control knob 18 is merely rotated in the opposite or clockwise direction until the lug 22 contacts the abutment 23 at the other side of the mounting bracket 12, and during this rotation the terminal pins 35', 34 and 35 make and break contact with the spring 41 in opposite sequence to that described above. At no time is there an open circuit condition, as will be readily understood.

It should thus be apparent that we have accomplished the objects initially set forth. We have provided a novel and highly practical arrangement for employing a plurality of piezoelectric transducer elements in a pickup cartridge assembly having a plurality of selectively usable record-engaging styli, so that each stylus may be arranged in independent driving relation with a separate transducer element. This construction has been found to be superior in many respects to the more common construction wherein a plurality of styli drive a common transducer element, and particularly in the respect that each stylus-transducer combination may be adapted to produce the highest fidelity response for the system in which it is employed. For example, it may be desirable to provide a certain type of transducer element for use in micro-groove recording systems, while another type element may be most desirable to obtain the best response in standard recording systems. It is, of course, impossible to obtain this optimum arrangement where a single transducer element is driven in common by a plurality of styli.

The use of a plurality of transducer elements, each individually associated with a separate record-engaging stylus, is also desirable from the standpoint that undesirable output response caused by vibrations in the idle stylus is wholly eliminated.

An important feature of our invention resides in the described arrangement of switching the separate pickup units into and out of the amplifying circuit while manipulating the apparatus to present a new stylus in record-engaging position. It is, of course, undesirable to have both pickup units connected simultaneously into the amplifying circuit since not only is the response level of the operative unit substantially lower than otherwise, but undesirable responses may be caused by the idle pickup unit.

Our switching arrangement is novel and advantageous in another respect, moreover, namely, in that at no time during a changeover from one stylus to another is there an open circuit condition in the amplifying circuit which could cause an undesirable hum to be emitted from the sound translating system.

It should be understood, however, that the specific embodiment herein shown and described in detail is intended to be illustrative only, and reference should therefore be had to the appended claims in determining the full scope of the invention.

We claim:

1. In a phonograph pick-up cartridge assembly of the type having a plurality of record-engaging styli the combination of a plurality of separate transducer elements each individually associated with a stylus, rotatable carrier means for said transducers and styli adapted when in various rotative positions to position various of said styli in record-engaging position, electrical output conductors for said assembly, means to connect said conductors in series relation with only the operatively positioned one of said plurality of transducer elements,

said transducer elements each having terminal pins extending therefrom, and said switching means including a contact member adapted to contact a terminal pin of said operatively positioned one of said plurality of transducer elements and no other.

2. Apparatus according to claim 1 further characterized by said terminal pins and contact member being so oriented that a pin is in contact with said member in all rotative positions of said carrier means.

3. In a phonograph pick-up cartridge assembly of the type having a plurality of record-engaging styli the combination of a plurality of separate transducer elements each individually associated with a stylus, rotatable carrier means for said transducer elements and said styli adapted when in various rotative positions to position various of said styli in record-engaging position, electrical output conductors for said assembly, means to connect one of said conductors in common to one terminal of each of said transducer elements, switching means to connect the other of said conductors to the other terminal of only the operatively positioned one of said plurality of transducer elements, said transducer elements being positioned symmetrically about the rotative axis of said carrier means, each of said transducer elements having a terminal pin extending longitudinally therefrom, said switching means comprising a spring contact member extending transversely of said longitudinal axis and spaced transversely thereof, and said spring contact member and said terminal pins being so oriented that when a stylus is in record-engaging position said contact member contacts only the pin associated with the said operatively positioned one of said plurality of transducer elements.

4. Apparatus according to claim 3 further characterized by one of said transducer elements having a second terminal pin, conductor means connecting said second terminal pin with said one of said conductors, said pins and contact member being so oriented that during rotation of said carrier means to position a new stylus in record-engaging position said second terminal pin contacts said contact member to maintain a closed circuit between said conductors.

5. In a phonograph pick-up cartridge assembly of the type having a plurality of record-engaging styli the combination of a plurality of separate transducer elements each individually associated with a stylus, rotatable carrier means for said transducer elements and said styli adapted when in various rotative positions to position various of said styli in record engaging position, electrical output conductors for said assembly, means to connect one of said conductors in common to one terminal of each of said transducer elements, switching means to connect the other of said conductors to the other terminal of only the operatively positioned one of said plurality of transducer elements, a mounting bracket for said carrier means, said carrier means and said bracket means being of current conductive material, said means to connect including current conductive means connecting one terminal of each of said transducer elements with said carrier means, and said one of said conductors being connected to said mounting bracket.

6. Apparatus according to claim 5 further characterized by spring means acting upon said carrier means and said mounting bracket to maintain electrical contact therebetween at all times.

7. In a phonograph pick-up cartridge assembly of the type having a plurality of record-engaging styli the combination of a plurality of separate transducer elements each individually associated with a stylus, rotatable carrier means for said transducer elements and said styli adapted when in various rotative positions to position various of said styli in record-engaging position, a mounting bracket for rotatably mounting said carrier means, electrical output conductors for said assembly, means to connect one of said conductors to one terminal

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of the operatively positioned one of said plurality of transducer members, switching means to connect the other terminal of only the said operatively positioned transducer to the other of said conductors, said switching means comprising a yieldable contact member carried by said mounting bracket and positioned adjacent the rotative axis of said carrier, said switching means being operative during rotation of said carrier to present a new stylus in record-engaging position to effect a direct connection between said conductors, subsequently to disconnect said first mentioned operatively positioned transducer from said other conductor, further subsequently to connect another transducer to said other conductor, and still subsequently after connecting said another transducer between said conductors breaking said previously mentioned direct contact whereby said another transducer is operatively positioned.

8. Apparatus according to claim 7 further characterized by said switching means including a plurality of terminal pins extending from said transducers, said pins being offset from said longitudinal axis and adapted to contact said yieldable member, certain ones of said pins being connected to said transducers only, and certain others of said pins being connected to said one of said conductors.

9. In a phonograph pick-up cartridge assembly of the type having a plurality of record-engaging styli the combination of a plurality of separate transducer elements each individually associated with a stylus, rotatable carrier means for said transducers and styli adapted when in various rotative positions to position various of said styli in record-engaging position, electrical output conductors for said assembly, means to connect said conductors in series relation with only the operatively positioned one of said plurality of transducer elements, and said last mentioned means including means to maintain a closed electrical circuit between said conductors during rotation of said carrier.

10. In a phonograph pick-up cartridge assembly of the type adapted to be secured in the outer free end of a phonograph tone arm comprising a mounting bracket adapted to be attached to said tone arm, a generally

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horizontally extending and relatively thin carrier member rotatively carried by said mounting bracket, means to rotate said carrier member, a pair of separate transducer elements mounted on opposite sides of said carrier member, each of said transducer elements comprising a mechanical-electrical transducer, a record-engaging stylus and a driving member, a pair of electrical output conductors for said assembly, means to connect one of said conductors in common to one terminal of each of said transducer elements including said carrier member, and switching means to connect the other of said conductors to the other terminal of only the operatively positioned one of said transducer elements.

11. In a phonograph pick-up cartridge of the type adapted to be secured in the outer free arm of a tone arm comprising a U-shaped mounting bracket adapted to be attached to said tone arm, a generally horizontally extending and relatively thin carrier member rotatively supported by and extending between the depending leg portions of said bracket, a control member journaled in said bracket and having a driving connection with said carrier member adapted to protrude through the tone arm to facilitate rotation of said carrier member, a pair of separate transducer elements mounted on opposite sides of said carrier member, each of said transducer elements comprising a mechanical-electrical transducer and a record-engaging stylus, a pair of electrical output conductors for said assembly, and means operative upon rotation of said carrier to position one of said styli in record-engaging position to connect the transducer associated with said one of said styli in series with said conductors, and switching means being simultaneously operative to disconnect the other of said transducer elements from said conductors.

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