

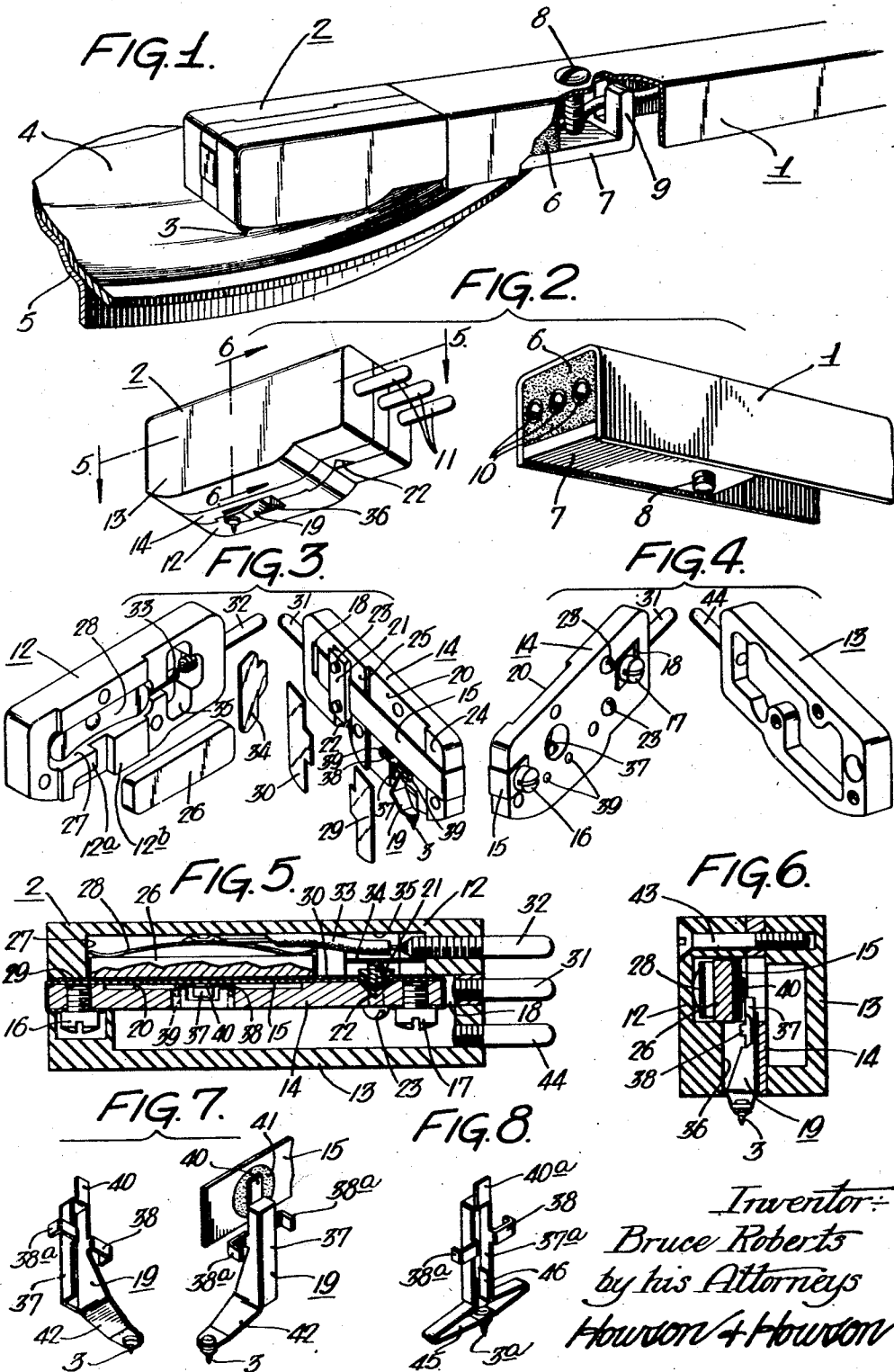
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PHONOGRAPH PICK-UP DEVICE

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PHONOGRAPH PICKUP DEVICE

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This invention relates to phonographic pick-up devices and more particularly to a novel pick-up of the capacity or condenser type.

One object of the invention is to provide a capacity type pick-up which is so constructed as to minimize the need for amplification of the generated signal. To this end the invention provides a capacity type pick-up in which the condenser elements or plates are located very close to one another, so that the variations of capacity, due to vibratory movement of one element, represent a large proportion of the normal capacity. Consequently, the variations of the capacitive reactance represent a large proportion of the normal reactance.

Another object of the invention is to provide a capacity type pick-up of this character which is readily capable of economic manufacture, and which requires no precision machined parts and no difficult fitting of parts in assembly.

A further object of the invention is to provide a novel compliant mounting between the pick-up unit and its associated tone arm, whereby to effect a desired low frequency cut-off and to prevent tone arm resonance.

Other objects and features of the invention will be apparent from the following detailed description in connection with the accompanying drawing, in which:

Fig. 1 is a perspective view of the novel pick-up device in association with a record;

Fig. 2 is a perspective illustration of the pick-up unit and the associated compliant mounting therefor;

Figs. 3 and 4 are perspective illustrations of the parts of the pick-up;

Fig. 5 is a sectional view taken along line 5—5 of Fig. 2;

Fig. 6 is a sectional view taken along line 6—6 of Fig. 2;

Fig. 7 illustrates in perspective the stylus device forming a part of the pick-up; and

Fig. 8 is a perspective view of an alternative form of the stylus device.

Referring first to Fig. 1, there is shown a tone arm 1 carrying the pick-up unit 2, whose stylus 3 is in engagement with a record 4 on a turntable 5. The tone arm 1 is preferably of inverted channel form, and disposed within the end portion thereof is a compliant body or member 6, which may be formed of rubber or other suitable compliant material. A clamping plate 7 is adjustably secured to the tone arm by means of a screw 8 and serves to retain the compliant member 6 and also to vary the compliance there-

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of in accordance with the adjustment of screw 8. As may be seen in Fig. 1, one end of the clamping member 7 is turned up at 9 and is adapted to engage the under surface of the top portion of the tone arm, so that the plate 7 may pivot about the point of engagement in response to adjustment of the screw 8. A plurality of contact receptacles 10 are embedded in the compliant member 6, as shown in Fig. 2, and are adapted to receive contact prongs 11, which are provided on the pick-up unit 2. By means of this arrangement, the pick-up unit is removably attachable to the tone arm through the compliant mounting member 6. The compliant mounting of the pick-up unit will be discussed further hereinafter following the detailed description of the pick-up unit, the construction of which constitutes the principal feature of the invention.

As shown in Figs. 2 to 6, the pick-up unit 2 comprises a pair of outer insulating members 12 and 13 and an inner metallic member 14, the latter being "sandwiched" between the two outer members when the pick-up is assembled. In Fig. 3, the members 12 and 14 are shown in a manner to illustrate their construction and cooperative assembly, while in Fig. 4 the members 13 and 14 are shown in a manner to illustrate their cooperative construction and arrangement.

Referring to the metallic member 14, as best illustrated in Figs. 3 and 4, this member serves to support a thin flexible metallic strip 15 which extends longitudinally of member 14 on one side thereof, and the end portions of which are secured to member 14 by means of attachment screws 16—17. It will be seen that one end of the strip 15 extends about an end of member 14 to the opposite side of said member, while the other end of the strip extends through an opening 18 in said member to the opposite side thereof. The strip 15 constitutes the movable element of the condenser and its intermediate portion is adapted to be vibrated by a stylus device 19 secured to said portion. To permit such vibration of strip 15, its supporting member 14 is recessed at 20, it being understood that the depth of recess 20 is not critical, since incidental capacity variations between member 14 and strip 15 are not utilized. The strip is held taut and flat by means of a wedge 21 seated in a recess 22 of member 14 and adjustably secured to said member by means of screws 23. Thus, the strip 15 is maintained perfectly flat in engagement with the faces 24—25 of member 14 and in spanning relation to the recess 20. As shown in Fig. 4, the outer in-

insulating member 13 is recessed to accommodate the aforementioned screws when the parts are secured together in assembled relation.

The insulating member 12 is adapted to freely support a rigid metallic element 26 which constitutes the other element or plate of the condenser. To this end, the member 12 is recessed at 27 so as to seat the element 26. A bowed spring member 28 is disposed within the recess 27 and serves to urge element 26 toward the strip 15 when the parts are assembled. A very small space is maintained between the condenser elements 15 and 26 by thin insulating sheets 29—30, which are adapted to be interposed between the portions of said elements adjacent the faces 24 and 25. These sheets 29 and 30 constitute the sole elements which determine the spacing between strip 15 and the other condenser plate 26. It will be appreciated that the thickness of these spacers may be readily, and economically, held within the necessary close tolerances.

The metallic member 14 is provided with a contact prong 31 which is electrically connected to the vibratile ribbon 15 through the supporting member 14. Insulating member 12 is also provided with a contact prong 32 which is connected to spring member 28 through a connection 33. Thus, the prong 32 is electrically connected to element 26 through the engagement of the latter with the spring member 28. An insulating sheet 34 is adapted to be disposed in a recess 35 of member 12 which receives the projecting part of wedge 21.

The stylus device 19 is pivotally carried by member 14 and projects through an opening 36 (see Fig. 2) formed by recesses in members 12 and 14. As shown in Fig. 7, the stylus device comprises a stylus holder 37 having laterally extending arms 38 with spaced parallel extensions 38a which seat in cylindrical recesses 39 provided in the member 14 so as to pivotally support the stylus carrier. Raised portions 12a and 12b of member 12 are adapted to abut the lateral arms 38, thereby holding the stylus securely while permitting the desired small rotational movement about said arms. The stylus also has an upwardly projecting finger 40 which is secured to the rear face of strip 15, for example by means of a suitable adhesive cement shown at 41. Member 14 is recessed to accommodate the stylus carrier as illustrated in Figs. 3 and 4. At its lower end the stylus carrier has a laterally extending arm 42 which carries the stylus 3. The arrangement is such that lateral movement of the stylus, in response to lateral cut undulations of a record groove, effects pivotal movement of the stylus carrier about the pivot arms 38, so as to vibrate the flexible strip 15 in relation to element 26. By virtue of the spring arm 42 the stylus may recede into the pick-up housing or casing, thus preventing injury to the stylus in the event that the pick-up is accidentally dropped. The parts of the pick-up are held in assembled relation by means of fastening screws such as shown at 43 in Fig. 6.

It will be seen from Figs. 5 and 6 that the adjacent surfaces of the condenser elements 15 and 26 are very close to one another, but accurately spaced by virtue of the aforementioned insulating spacing members 29 and 30. The spacing of condenser elements 15 and 26 is, of course, of magnitude sufficient to accommodate the maximum strip displacement encountered in practice. It will be noted from Fig. 6 that the stylus device 19 operates as a lever to effect the vibrations of

strip 15 in response to lateral movements of the stylus.

By means of the contact prongs on the pick-up unit, the latter is removably attachable to the associated tone arm, as previously indicated. In the interest of better securement of the pick-up unit and also to provide a balanced structure, a dummy prong 44 is provided on member 13, and a corresponding dummy receptacle is provided on the tone arm.

An alternative form of stylus device is shown in Fig. 8. In this instance the stylus carrier 37a is formed similarly to that above described but instead of having a laterally-extending stylus arm, the carrier serves to support a folded spring member 45 having upwardly extending arms 46 which are secured to the carrier 37a. The stylus 3a is supported centrally of the folded spring 45, as illustrated. In this instance the stylus is retractable by reason of its mounting on the spring member. This form may be employed in instances where the torsional compliance of laterally extending arm 42 is not required. The alternative form (Fig. 8), due to its lesser compliance, effects greater strip movement for a given needle displacement.

From the foregoing description, it will be seen that the invention has provided a capacity type pick-up of such construction that the parts can be easily manufactured and assembled, and in which the condenser elements may readily be brought into very close relation, so that the capacity variation attained represents a large proportion of the normal capacity. Consequently, when the present invention is employed in combination with an oscillator to produce a frequency-modulated carrier signal, very high carrier frequency deviations will be obtained. A typical F. M. phonograph pick-up is disclosed and claimed in United States Patent No. 2,322,621, issued June 22, 1943. It will be understood of course, that the pick-up may be employed in any instance where it is desired to produce a signal by means of capacitive reactance variations.

With regard to the compliant mounting of the pick-up, as hereinbefore described, such mounting further improves the operation of the pick-up by effecting a desired low frequency cut-off and by preventing tone arm resonance. By providing a compliance of proper value between the pick-up and the tone arm, the low frequency cut-off can be made to occur at a selected point in the frequency response range. The compliant mounting illustrated affords a simple means for controlling the low frequency response. Moreover, the adjustability of the compliance by means of screw 8 enables accurate adjustment of the cut-off point.

While a single embodiment of the invention has been illustrated and described, it will be understood that various other embodiments and modifications may be resorted to within the scope of the invention as defined in the appended claims.

I claim:

1. A phonograph pick-up of the capacity type, comprising a three-part supporting structure or casing including two outer insulating members and a metallic member adapted to be interposed between said outer members, means for removably securing said members together, a flexible metallic strip having its end portions removably secured to said metallic member, said metallic member being formed to permit vibration of the intermediate portion of said strip, a stylus con-

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nected to said intermediate portion to vibrate the same, and a rigid conductive element removably supported by one of said outer members in closely spaced relation to said strip, said rigid element and said strip constituting a condenser whose capacitance is varied by the vibration of said strip.

2. A phonograph pick-up of the capacity type, comprising a three-part supporting structure or casing including two outer insulating members and a metallic member adapted to be interposed between said outer members, means for removably securing said members together, a flexible metallic strip having its end portions removably secured to said metallic member, said metallic member being formed to permit vibration of the intermediate portion of said strip, means for maintaining said strip taut and flat, a stylus connected to said intermediate portion to vibrate the same, a rigid conductive element freely supported by one of said outer members, resilient means urging said element toward said strip, and thin insulating means for maintaining said element in closely spaced relation to said strip, said rigid element and said strip constituting a condenser whose capacitance is varied by the vibration of said strip.

3. A phonograph pick-up of the capacity type, comprising a three-part supporting structure or casing including two outer insulating members and a metallic member adapted to be interposed between said outer members, means for removably securing said members together, a flexible metallic strip having its end portions removably secured to said metallic member, said metallic member being formed to permit vibration of the intermediate portion of said strip, a stylus connected to said intermediate portion to vibrate the same, a rigid conductive element removably supported by one of said outer members in closely spaced relation to said strip, said rigid element and said strip constituting a condenser whose capacitance is varied by the vibration of said strip, a terminal prong on said metallic member, said prong being electrically connected to said strip through the metallic member, and a terminal prong on said one outer member and electrically connected to said rigid element.

4. A phonograph pick-up device, comprising a tone arm, a compliant body carried within the end portion of said tone arm, an adjustable pressure plate carried by said tone arm and engaging said body to vary the compliance thereof, a plurality of contact receptacles carried by said member, and a pick-up unit having contact prongs insertable in said contact receptacles for removable attachment of said pick-up unit to said tone arm through said compliant member.

5. A phonograph pick-up device, comprising a tone arm, a compliant body carried within the end portion of said tone arm, an adjustable pressure plate carried by said tone arm and engaging said body to vary the compliance thereof, a pick-up unit, and inter-engaging contact means on said compliant member and said pick-up unit for effecting electrical connection to the pick-up unit and for removably attaching said unit to said tone arm through said compliant member.

6. In a phonograph pick-up of the capacity type, a pair of support members secured together in juxtaposed relation, a flexible metallic strip having spaced portions secured to one of said support members, said one support member being formed to permit vibration of an intermediate portion of said strip, the other of said support

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members having a recess adjacent to said strip, a rigid metallic element freely supported in said recess, resilient means in said recess urging said rigid element toward said strip, insulating means arranged to prevent contact between said strip and said element and to establish a predetermined spacing therebetween, and a stylus connected to the intermediate portion of said strip to vibrate the same.

7. In a phonograph pick-up of the capacity type, a pair of support members secured together in juxtaposed relation, a flexible metallic strip having spaced portions secured to one of said support members, said one support member being formed to permit vibration of an intermediate portion of said strip, an adjustable wedge carried by said one support member and engaging said strip to maintain it taut and flat, a rigid metallic element carried by the other support member adjacent to said strip, insulating means arranged to prevent contact between said strip and said element and to establish a predetermined spacing therebetween, and a stylus connected to the intermediate portion of said strip to vibrate the same.

8. In a phonograph pick-up of the capacity type, a support structure including a metallic member, a relatively narrow flexible metallic strip having spaced portions secured to said member and a vibratile portion intermediate said spaced portions, said member being recessed to permit vibration of the intermediate portion of said strip, said member also having a recess adjacent one of the secured portions of said strip, a wedge extending transversely across said strip in cooperative relation with said recess, means for drawing said wedge into said recess to render the intermediate portion of said strip taut and perfectly flat, a rigid flat-faced metallic member held by said support structure in very close relation to the intermediate portion of said strip, and a stylus connected to the intermediate portion of said strip to vibrate the same.

9. In a phonograph pick-up of the capacity type, a pair of support members secured together in juxtaposed relation, a flexible metallic element supported by one of said support members in confronting relation with the other support member, said element having spaced portions secured to said one support member, the latter being formed to permit vibration of an intermediate portion of said element, said other support member having a recess adjacent to said element, a rigid metallic element freely supported in said recess, resilient means in said recess urging said rigid element toward said flexible element, insulating means arranged to prevent contact between said elements and to establish a predetermined spacing therebetween, and a stylus connected to the intermediate portion of said flexible element to vibrate the same.

10. In a phonograph pick-up of the capacity type, a pair of support members secured together in juxtaposed relation, a flexible metallic element supported by one of said support members in confronting relation with the other support member, said element having spaced portions secured to said one support member, the latter being formed to permit vibration of an intermediate portion of said element, an adjustable wedge carried by said one support member and engaging said element to maintain it taut and flat, a rigid metallic element supported by said other support member adjacent to said flexible element, insulat-

ing means arranged to prevent contact between said elements and to establish a predetermined spacing therebetween, and a stylus connected to the intermediate portion of said flexible element to vibrate the same.

11. In a phonograph pick-up of the capacity type, a pair of support members adapted to be secured together in face-to-face relation, a flexible metallic strip extending along the face of one of said support members, the ends of said strip extending to the opposite side of said one support member and being secured thereto, an adjustable wedge on the face of said one support member engaging said strip to keep it taut and flat, said one support member being formed to permit vibration of the intermediate portion of said strip, a rigid metallic element carried by the other support member adjacent to said strip, insulating means arranged to prevent contact between said strip and said element and to establish a pre-determined spacing therebetween, and a

stylus connected to the intermediate portion of said strip to vibrate the same.

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