

March 10, 1936.

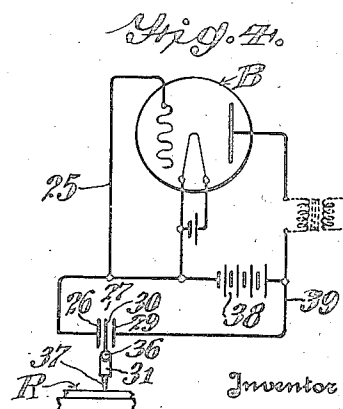
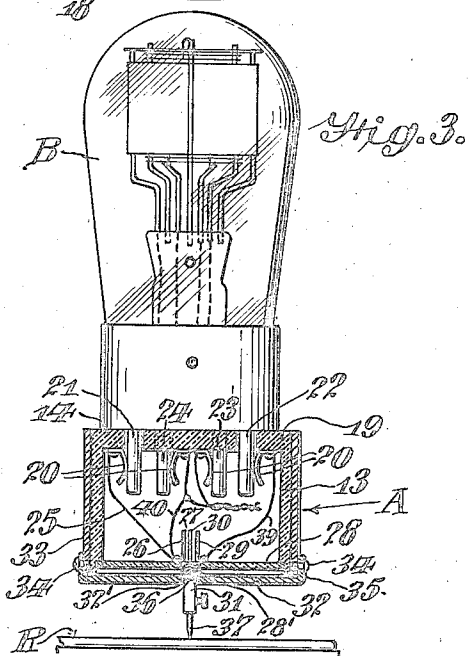
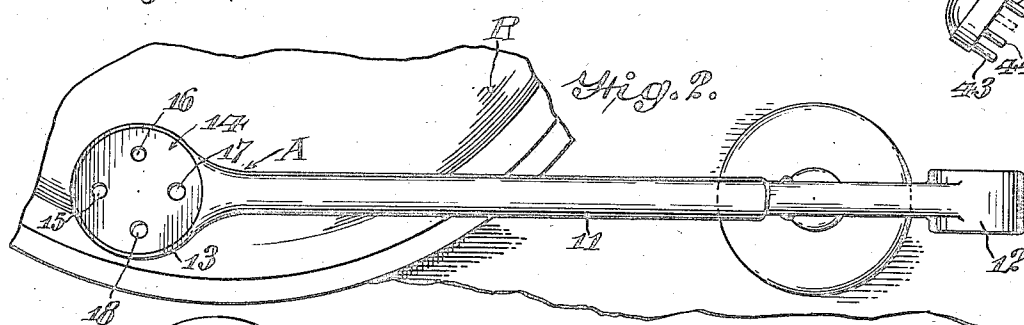
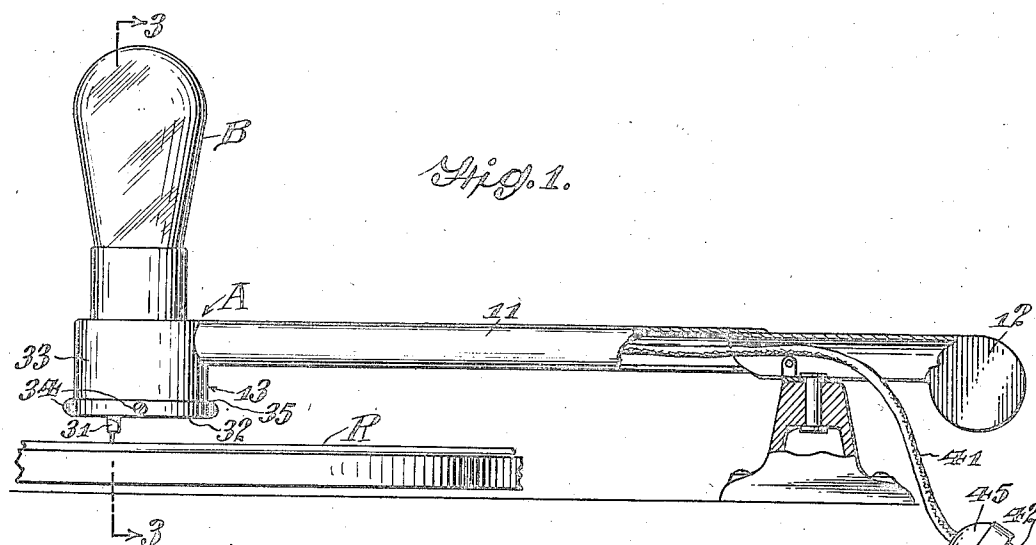
E. G. MURPHY

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ELECTRIC PHONOGRAPH PICKUP

Filed Aug. 21, 1931

2 Sheets-Sheet 1



Edmund G. Murphy

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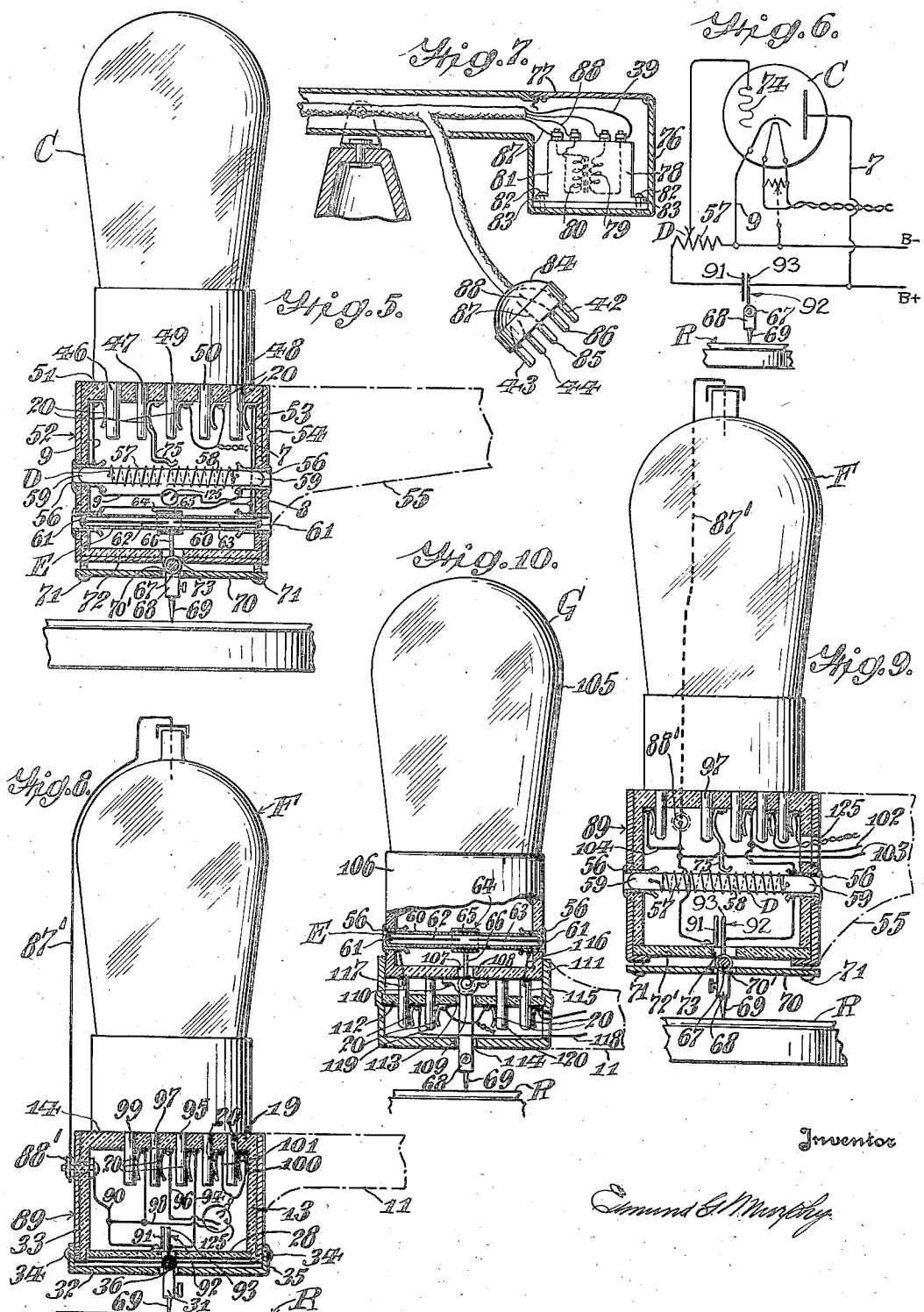
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ELECTRIC PHONOGRAPH PICKUP

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2 Sheets-Sheet 2



Inventor

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UNITED STATES PATENT OFFICE

2,033,479

ELECTRIC PHONOGRAPH PICKUP

Edmund G. Murphy, Philadelphia, Pa.

Application August 21, 1931, Serial No. 558,561

19 Claims. (Cl. 179—100.41)

This invention in general relates to means for translating mechanical vibrations into electrical oscillations and more particularly to a novel method and means for the electrical transcription of phonograph records, having for its principal object the provision of an improved phonograph pickup of a novel design, construction and coordination of related parts assuring a simplified mechanical structure and a decided gain in electrical efficiency in the way of a more sensitive and responsive pickup.

A special object of the invention is to provide a novel combination phonograph pickup and vacuum tube amplifier unit.

Another object of the invention is to provide an electrical phonograph pickup of a type permitting the practically direct application of the electrical oscillations created by the vibrating reed of the pickup to the juxtaposed grid prong of the amplifying tube, thereby eliminating the undesirable long grid leads from the pickup hitherto required and consequently eliminating in large measure circuit interaction, electric absorption and resistance losses in the sensitive grid or pickup circuit.

Another object is to provide a novel unit in the way of a combination electrostatic phonograph pickup and vacuum tube unit which may be coupled or plugged into a conventional radio set or vacuum tube amplifier system.

Another object is the provision of a combination phonograph pickup and vacuum tube amplifier unit with circuit and tone controlling means embodied therein.

An additional object is to provide, in a modified form of the invention, a novel unit embodying an electrical phonograph pickup, a vacuum tube and one stage of audio amplification.

A still further object of the invention is the provision, in another modification of the invention, of a novel vacuum tube formed with phonograph pickup means as a component part thereof.

Other objects, advantages and conveniences residing in the design, construction, combination and arrangement of coating parts will appear hereinafter when taken in connection with the accompanying drawings, in which

Figure 1 is a side elevational view, partly in section, with parts broken away, of an embodiment of my invention.

Fig. 2 is a top plan view of the device with the vacuum tube removed;

Fig. 3 is a sectional view, taken on line 3—3 of Fig. 1;

Fig. 4 is a diagrammatic representation of the

electrical circuit embodied in the device shown in Figs. 1, 2 and 3;

Fig. 5 is a fragmentary sectional view, partly in elevation of a modified form of the invention showing the addition of circuit and/or tone and volume control;

Fig. 6 is a diagrammatic view of a circuit incorporated in a modified form of the invention;

Fig. 7 is a longitudinal view of another modification of the invention wherein one stage of audio amplification has been embodied;

Figure 8 is a fragmentary sectional view of another modification showing a screen grid tube directly employed in combination with coating pickup means;

Figure 9 is a fragmentary sectional view of another modified form showing means for applying a variable voltage to the shield grid of a screen grid tube which is directly and coactingly coupled to electrostatic pickup means.

Figure 10 is a fragmentary sectional view of still another modification of the invention wherein a novel vacuum tube is illustrated, showing an electrostatic pickup directly incorporated therein as a component part thereof.

For the purpose of illustrating my invention I have shown in the accompanying drawings several forms thereof which are at present preferred by me, since the same have been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of the instrumentalities as herein shown and described.

At the present time, as is well known, electrical phonograph pickups for the electrical transcription of records have practically superseded the much less efficient diaphragm or mechanical types of pickups. The conventional electromagnetic types of electrical pickups employ an armature attached to a vibrating reed or stylus moving over a phonograph record, the comparatively feeble potentials generated by the said armature being conducted by comparatively long leads or wires to the grid electrode of the first vacuum tube. The said long grid leads have proven in practice to be one of the chief difficulties to satisfactory electrical transcription of phonograph records by reason of the reduction of the already feeble potentials generated, by absorption, resistance and electrical interaction between the grid and plate circuits, which is prone to occur. The difficulty here encountered is substantially identical with

that met with in radio receiving circuits wherever comparatively long grid leads are employed, and particularly is this true in the grid circuit of the first or detector tube.

By the present device, I am enabled with the utmost simplicity of structure to apply the electrical oscillations generated by a vibrating reed or plate in an electrostatic field, as preferably employed for example, in the present invention, to the contiguous grid prong of the detector or first amplifier tube, in such wise that substantially no paralleling of the grid and plate leads occurs, and as a consequence, practically no adverse interaction of the grid circuit with the plate circuit is involved. The response in the sound indicating means obtained by the present invention is markedly indicative of the increased efficiency secured by the elimination of those factors involving the electrical losses alluded to above and the interaction of related circuits.

Electrical phonograph pickups of the electromagnetic type are now customarily employed, but it has been found that in addition to the difficulties above-mentioned, unless due care is exercised to match the impedance of the tube to which it is immediately connected, there will not be a maximum voltage transfer from the electrical pickup to the grid of the vacuum tube for reasons based upon elementary principles of electricity. In the present pickup, electrostatic means are preferably employed to electromagnetic for reasons which will appear hereinafter.

In the embodiment of the invention shown in Figs. 1 to 4 inclusive, A designates the pickup unit which includes a coacting vacuum tube B. The pickup device A comprises a hollow arm 11 having a counterbalancing weight 12 at one end and at the other a shell or casing 13 formed of any suitable material and provided with a socket or vacuum tube receiving means 14 electrically connected to electrostatic pickup means including a stylus, hereinafter described, and mounted on the detachable bottom of the said shell 13 for coaction with a phonograph record R.

The vacuum receiving means 14 includes a plurality of holes 15, 16, 17 and 18 formed in the top 19 of the shell 13. Adjacent each of the holes 15, 16, 17 and 18 a resilient metal conducting lug 20 is secured. When the grid, plate, plus and minus filament prongs 21, 22, 23 and 24 respectively of the vacuum tube B are thrust through the holes 15, 16, 17 and 18, it will be seen that one of the lugs 20 which directly engages the grid prong 21 of the vacuum tube B, is connected by the short wire lead 25 to one of the plates 26 of the condenser 27 fastened on the bottom 28 of the shell 13 and forming a part of the electrostatic pickup means which includes another plate 29 fastened to the upper surface of the bottom 28. Between the two fixed plates 26 and 29 a movable plate or reed 30 protruding through a hole 28' in the bottom 28 and serving as an armature in the electrostatic field between the plates 26 and 29 of the condenser 27, is adapted to vibrate.

As best shown in Fig. 3, the plate 30 is fastened to a stylus member 31 which is rockingly mounted between the exterior surface of the bottom 28 and a clamping or bearing plate 32. The bearing plate 32 which has an opening 32' through which the stylus member 31 projects, is removably secured to an outside housing 33, preferably formed of metal, in any suitable manner as by screw bolts 34 which pass through registering holes in an upturned lip or flange 35 of the plate 32, and in the adjacent portions of the walls of housing

33 and shell 13 thereby anchoring the housing 33, and bearing plate 32 to the said shell 13.

For the purpose of clearer illustration in Fig. 3, the condenser 27 including the reed or plate 30 is shown in side elevation, it being understood that the pintle and ball joint 36 of the stylus member 31 in practice is arranged preferably to permit the needle 37 which protrudes through the aligned openings 28' and 32', mentioned above, to move laterally in the grooves of the conventional disc type of phonograph records. The stylus member 31 may be cushioned with sponge rubber (not shown), following the conventional practice in electromagnetic pickups, with a view to permitting a desired slight freedom of movement, while dampening excessive vibrations.

The operation of the present embodiment will now be understood by reference to the drawings in connection with the following description:—

When the needle 37 passes over a phonograph record R in the well known manner, vibrations will be communicated to the plate or reed 30. As the said plate vibrates between the two fixed plates 26 and 29, corresponding variations in the charge held by the small condenser 27 one plate 26 of which is connected to the grid prong 21 of the vacuum tube B, will take place, it being observed by reference to Figure 4, that the plates 26 and 29 of the condenser 27 are connected to the minus and plus poles of a source of electrical energy, such as the "B" battery 38, for the purpose of applying a biasing voltage to condenser 27, thereby preventing any possibility of phase reversal of the grid of the vacuum tube B during operation of the device while improving the electrical efficiency, and translating characteristics of the pickup device as a unit. Within limits dictated by the mechanical construction of the condenser 27 and the nature of the constants employed, it will be found the present electrostatic pickup will function better as the potential applied across the plates 26 and 29 increases.

Referring to Fig. 3 it will be seen that the plate prong 22 of the vacuum tube B is connected by one of the lugs 20 and lead 39 to the fixed plate 29 of the condenser 27, while the minus filament prong 24 is connected by lead 40 to the other fixed plate 26 of the condenser 27. The lugs 20 connected to the plate, plus and minus filament prongs 22, 23 and 24 respectively are electrically connected by three wire leads (not shown) in a cable 41 to plate, plus and minus filament prongs 42, 43, 44 secured on an adapter plug 45 attached to the said cable 41. The prongs 42, 43, and 44 are of the same size and arrangement as the prongs of a conventional vacuum tube such as B and consequently are adapted to be thrust into the vacant socket of the detector of the first amplifier tube socket of the radio receiving set or vacuum tube amplifier from which the tube B has been removed. The output of the vacuum tube B which reproduces and amplifies the variation of potentials in the condenser 27 induced by the vibrations of the movable plate or reed 30 as the needle 37 passes over a phonograph record is applied to the input circuit of another vacuum tube of the radio receiving set or thermionic amplifier.

By the present means it will be observed that since the plug 45 has no grid prong, the grid leak and condenser in the detector tube circuit within the radio receiving set will now be automatically disconnected from the circuit, thus permitting the detector tube which may be the tube

B on the end of the pickup arm 11 to serve directly as an amplifier.

Particular attention is directed to the fact that the long grid lead heretofore employed which ran through the hollow arm 11 and paralleled the plate lead to the detector tube or the first amplifier tube is now completely done away with, thereby substantially increasing the energy available for application to the grid of the tube, in this case the grid of the vacuum tube B, while eliminating the most prolific source of undesired circuit interaction between the grid and plate circuit, parasitic capacity effects, and the circuit losses mentioned above.

Since the entire assembly including the vacuum tube B, by reason of the elimination of the heavy field magnets and windings of the electromagnetic type of phonograph pickup, may be made lighter in weight than conventional electrical pickups, if desired the arm 11 may be manipulated by grasping the tube B which is held in rigid vertical position by the resilient plugs 20 which clampingly engage the prongs of the said vacuum tube B.

In other modified forms of the invention hereinafter described, it will be shown how the device lends itself to the use of electron-discharge devices or vacuum tubes of various types including alternating current, screen grid, etc. which, if desired, may be substituted for other types in the receiving set or amplifier.

Referring to Figures 5 and 6 a modification is illustrated wherein the electrostatic pickup means comprises adjustable interchangeable elements of different values of capacity and resistance which may be removably inserted in the device for controlling the tone and volume as well as certain electrical characteristics of the associated vacuum tube circuit.

The form of the invention illustrated in Fig. 5 is preferably adapted for use with radio receiving sets and amplifiers employing alternating current, or so called electrified receiving sets. The vacuum tube C shown in Fig. 5 may be of the type employing a separate heater or cathode, known in the trade as the 227 type, and having five prongs 45, 47, 48, 49 and 50 which are passed through holes in the top 51 of the casing 52, said holes in the top 51 of the casing 52 having positioned adjacent thereto lugs 20 of the type described above in connection with the embodiment of the device shown in Figures 1 to 4 inclusive.

In the present instance it will be observed by inspection of Figure 5 that the casing 52 which includes an inner shell 53 and an outer reinforcing housing 54 secured to a hollow arm 55 of the type shown in Fig. 1 and having a similar counterbalancing weight, is formed with two pairs of opposed holes in which eyelets or short sections of split metal tubes 56 are secured in any suitable manner as by heading over. These resilient tube sections 56 clampingly engage insertable cartridge elements D and E, one of which D comprises a resistance 57 wound on a tube of insulation 58, the resistance winding 57 being connected at the ends to metal caps 59 at either end of the insulation 58. The other element E is a cartridge condenser consisting of a tube 60 of dielectric such as glass, to the ends of which metal caps 61 are secured. Within the tube 60 a pair of metal rods 62, 63 are arranged which are secured to the metal caps 61. By a further inspection of Fig. 5 it will be noted that the reed 64 of the present device comprises a short sleeve or sec-

tion of metal tube stock 65 slidably mounted on the dielectric tube 60, and serving, as hereinafter described, as a part of the condenser E to vary the capacity of same. The tube section 65 is fastened to a bar 66 secured to a pintle and ball joint 67 forming a part of the stylus 68 of the present device in which stylus the stylus needle 69 is fastened. The pintle and ball joint 67 of this embodiment of the invention is mounted in such wise as to permit of a slight rocking movement as the needle 69 passes over the phonograph record R. The means employed for retaining the stylus 68 in position may consist of a clamping or bearing plate 70 having an opening 70' secured by bolts 71 to the removable bottom 72 of the casing 52, it being observed that the said bottom 72 has an opening 73 through which the reed 64 of the stylus 68 vibrates, as the needle 69 passes over the phonograph record R as the latter revolves.

The tube section 65 which forms a component part of the small cartridge condenser, as the reed 64 vibrates, will vary the capacity of the cartridge condenser E, and these variations of charge will be applied to the grid electrode 74 of the tube C via the resistance winding 57, and the resilient metal contact strip 75 forming a part of one of the resistance lugs 20 which engages the grid prong 47 of the tube C. As the cartridge element D is moved transversely a greater or less number of turns of the windings 57 will be brought into play thereby increasing or decreasing the resistance of the circuit. In this manner variations of potential across the resistance winding 56 caused by voltage changes in the condenser E connected thereto may be applied to the grid 74 of the vacuum tube for amplification in the well known manner the output being conveyed to the amplifying system of the radio receiving set or vacuum tube amplifier as described above, by means of a cable and an adapter plug of the type shown in the first embodiment of the invention, the plug (not shown) in this instance having an additional fourth prong for the completion of the B circuit. The circuit arrangement of this modification is shown in Fig. 6. The connections, which are comparatively few and simple, are seen in Fig. 5 wherein it will be noticed the cartridge condenser E, at the right hand end thereof is engaged by a metal tube section 56 electrically connected by a wire 7 to the plus pole of the plate supply, the said wire 7 being also connected to a lug 20 engaged by the plate prong 48 of tube C. The other or left hand end of the condenser E is joined to the right hand side of winding 57 of cartridge resistance D, as seen in Fig. 5, by a wire 8, which is secured at its upper end to a metal tube section 56 which clampingly engages one of the metal caps 59 connected to the winding 57 of element D, the other end of the winding 57 being joined to another metal cap 59 of the same element D which engages the tube section 56 joined by a wire 9 to a lug 20 in contact with the cathode prong 46 of tube C. The last mentioned lug 20 is also electrically connected by the same wire 9 fastened thereon, to the minus pole of the plate supply.

In Fig. 7 another modification is illustrated wherein one stage of amplification, which for example may be of the transformer-coupled type, is embodied. This embodiment in nearly all details is exactly similar to that shown in Fig. 1, but in this instance the counterbalancing weight for the arm 11 is a transformer which, it will be observed, serves in a double capacity; (1); as a

weight to balance the arm 11, and (2), as a voltage step-up, or step-down. The weighted end of the arm 11 accordingly is now a shell 76 having a hinged lid 77 which latter serves as a convenient means for inserting, adjusting and replacing an audio transformer 78 having primary and secondary windings 79, 80 respectively. The usual shielding metal casing 81 for the transformer 78 is provided with lugs 82 having holes through which the bolts 83 are passed, and threadedly engaged in the bottom of the shell 76.

The cable 41 has attached thereto an adapter plug 84 which, as shown in Fig. 7, has five prongs, instead of the three in the form illustrated in Fig. 1, the two extra prongs 85, 86 in the present adapter 84 being connected by wire leads 87, 88 to the secondary terminals of the audio transformer 78, the adapter plug 84 being plugged into the receiving set or thermionic amplifier so that the prong 85 for example is electrically connected to the grid of the tube receiving the output and the prong 86 to the grid return; i. e., the plus and minus filament in the last mentioned tube. It will be observed that the lead 39 to the plate of the vacuum tube B is now connected to one of the primary terminals of the audio transformer 78, the other primary terminal of which is connected to the prong 42, consequently energizing the plate electrode of the tube B through the transformer 78. When the device shown in Fig. 7 is in operation, the usual variations of voltage passing through the primary circuit 19 of the transformer 78 will be amplified in the secondary 80 and then applied to the grid (not shown) of the input tube.

If desired the amplification means shown in Fig. 7 which is of a transformer type may be replaced by any other amplification means customarily employed with a view to matching the amplification means of the present device with those incorporated in the particular receiving set or amplifier being used.

Fig. 8 discloses another form of the invention wherein a screen grid alternating current type of vacuum tube or electron-discharge device F is employed, the control grid electrode of which is connected by lead 87' to a small binding post 88' secured to the outside of the casing 89 of the present form of the invention, the binding post 88' being electrically connected by a wire 90 to a fixed plate 91 which forms a part of the condenser pickup means 92, the other and movable plate 93 of which is secured to a stylus assembly substantially similar to the one shown in Fig. 3, this being indicated by a corresponding similarity in the reference numerals employed. In Fig. 8, the condenser shown has one fixed and one movable plate instead of two fixed and one movable plate, as shown in Fig. 3. The rest of the apparatus is similar in its mechanical construction to the forms shown in Fig. 5 and Fig. 3, but is adapted for alternating current energization. The biasing voltage for the condenser 92 is obtained in the following manner:—

The lead 94 is connected to the plus side of the plate or B supply by means of an adapter plug as indicated above. It will be further noted that the lead 94 is connected to one of the wires fastened to a metal lug 20 engaging the plate prong 95 of the present tube, and also fastened to the movable plate 93 of the condenser 92. The opening 125 shown in the casings 52 and 13 of Figs. 5 and 8 permits the various filament, plate and cathode wires to be passed into the hollow arm 11.

An appropriate voltage for the screen grid electrode of the tube F is applied via the lead 96 to the lug 20 engaging the screen grid prong 97, this voltage being obtained from the receiving set or amplifier. The minus pole of the plate or B supply is connected to the fixed plate 91 by the lead 98 which also is connected with the lug 20 engaging the cathode prong 99 and also with the binding post 88. The filament energizing circuit includes the wires 100, 101 which latter lead to a suitable source of filament current. In the present form of the invention, it is assumed such substitutions of resistance, capacity, circuit connections, etc. for the necessary correspondence with the units employed in the receiving set or amplifier, will be made, the present arrangement shown being merely by way of example.

The operation of the present device is, of course, practically the same as that outlined above in connection with the other forms. The variations in the charge of the small condenser occasioned by vibrations of the movable plate or reed 93 will be applied to the control grid of the vacuum tube F via the lead 87. As is well known the screen grid tube is an exceedingly sensitive detector and amplifier and this form accordingly will yield results commensurate with the electrical characteristics of tubes of the screen grid type.

In Fig. 9, I have shown a variation of the type shown in Fig. 8. In the present form, means have been incorporated for applying a variable potential to the screen grid of the electron-discharge device or tube F which result is obtained by means of the cartridge resistance element D which is removably insertable in the base of the casing 89. The winding 57 of the element D which is joined at the ends to the metal caps 59 mentioned above, is engaged by the metal contact strip 75. The contact strip 75 is secured to or forms a part of one of the metal contact lugs 20 which in this form of the invention engages the prong 97 connected to the screen grid of the vacuum tube F. The biasing voltage for the condenser 27 is obtained by connecting the movable plate or reed 93 to the plus of the B supply through wire lead 102 which is also electrically connected to one of the metal sections of split tube 56, and also to the contact strip 75 through winding 57. The minus pole of the B supply is connected to a wire lead 103 to the other plate 26 of the condenser 27, and thence is electrically connected to the binding post 88' which is wired to the control grid of the tube F. The cathode of the tube F is connected by a wire 104 to the ground or minus B, etc. as the case may be, through an adapter plug of the type employed in this invention. In this form of the invention it will be seen when the cartridge resistance D is slid transversely of the insulating metal contact strip 75, turns of the winding 57 will be engaged in such a manner as to vary the resistance of the element D consequently varying the potential applied to the screen grid. The functioning of the apparatus otherwise is, of course, similar to the other forms.

In Fig. 10, I have shown a form of the invention in which an electron-discharge device or vacuum tube itself is constructed in such a manner as to conveniently accommodate a pickup in the base thereof, this pickup being preferably of the electrostatic type. The electron-discharge device G in question comprises an envelope 105 attached to a base 106 which latter has a pair of opposed holes receiving clamping metal tube sections 56 of the type described above,

and shown in Figs. 5 and 9. The tube sections 56, removably receive the cartridge condenser D on which slides or vibrates the metal sleeve 65 set forth above. The sleeve 65 is connected to the small bar 66 which passes through a hole 107 in the bottom of the base 106 of the tube G, the bar 66 being fastened to a pin 108 pivotally fastened on the exterior surface of the bottom of the tube base 106 by a small bracket or bearing plate 109 suitably secured thereon in any suitable manner as by bolts 110. The pin 108 forms a part of the stylus assembly having the needle 69. By inspection of Fig. 10 it will be seen that the casing 111 at one end of the present pickup arm 11 is modified being somewhat more shallow in depth while having removable vacuum tube engaging means which consists of a plate 112 of insulation provided with holes having the metal contact lugs 20 positioned adjacent thereto. The plate 112 has an opening 113 to admit the stylus 68 which latter passes through a hole 114 formed in the bottom of the present casing 111. The circuit of the present device, aside from some slight variations, is similar to that shown in the device illustrated in Figs. 1 and 5, the plate prong 115 which is connected to one of the metal tube sections 56 shown at the right hand side of the base of the tube G, engages a lug 20 connected to the B plus by a wire 116, the said lug 20 being fastened in the removable plate 112 of the casing 111. The grid prong 117 of the tube G is connected to the metal section 56 at the left of the base 106 of the tube G, it being observed by inspection of Fig. 10 that the grid prong 117 is engaged by another lug 20 which is electrically connected to the minus of the B supply by a wire 118. The other two prongs of the tube G, 119 and 120 are engaged by two lugs 20 which are connected by twisted wires to the plus and minus of the filament supply through a cable 41 having an adapter plug 45 of the same type shown in Fig. 1 of the invention. The operation of the device here again is practically identical with the other forms. As the needle 69 passes over the phonograph record R the charge of the cartridge condenser E will be varied in accordance with the vibrations of the stylus 68 and reed 64, these variations of charge being applied to the grid of the tube G via the metal section 56.

Attention is directed to the fact that the only change required in a conventional vacuum tube to accomplish the above objects and functions will be in the base thereof according to the form of the invention shown in Fig. 10, and this change merely consists in having the base 106 provided with clamping metal sections 56, and the opening 107 in the bottom of the base to admit the other portion of the stylus assembly; this latter being conveniently mounted for performing its functions by the little bracket or bearing plate 108.

The device illustrated in Figs. 5 and 6 in particular, which embodies resistance and capacity elements D and E respectively, lends itself to practically any circuit arrangement desired. For example, as best shown in Fig. 6, a variable negative grid bias can be applied to the grid electrode 74 of tube C by slidably engaging the winding 57 with the contact 75.

It will also be apparent by further inspection of Fig. 5 that by varying the potentials of the grid electrode 74, the output of tube C and consequently the volume desired from the sound indicating means of the coating radio receiving set or amplifier (not shown) may be graduated to suit individual requirements. Also, if desired

different values of resistance and capacity elements D and E may be substituted instantly, one for another, by thrusting out the elements in immediate use and inserting others.

I am aware that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and I therefore desire the present embodiment to be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

Having thus described my invention what I claim as new and desire to secure by Letters Patent, is:—

1. A unit of the kind described comprising in combination, an electrostatic pickup, an electron-discharge device separably mounted on said pickup, and adjustable means mechanically secured on said pickup and electrically coupled to said electron-discharge device for variably regulating the electrical input and output of said unit.

2. A unit of the kind described comprising in combination a phonograph pickup, an electron-discharge device mechanically and electrically connected to said pickup, and means removably insertable in said pickup for regulating the electrical input and output of said unit.

3. A unit of the kind described comprising in combination a phonograph pickup, an arm supporting said pickup, an electron-discharge device mechanically arranged on the arm and electrically connected to said pickup, and means secured to said arm for varying the circuit characteristics of said electron discharge device and pickup.

4. A unit of the kind described comprising in combination a phonograph pickup comprising a movably mounted arm having electron-discharge tube receiving means secured at one portion thereof, a condenser mounted on said vacuum tube receiving means, a stylus assembly including a reed coaxially connected to said condenser, and instrumentalities within said electron-discharge tube receiving means for adjusting and varying the electrical characteristics of said pickup and electron-discharge device.

5. A phonograph pickup comprising a member movably mounted on a support, said member having electron-discharge device receiving means formed at one portion thereof, said electron-discharge device receiving means having a condenser secured thereto, a stylus reed forming a plate of said condenser secured on said means and operated by the engagement of said stylus reed with a phonograph record, and an electron-discharge device separably mounted on said means and mechanically and electrically connected to said condenser.

6. In a device of the character described, the combination of a support, a vacuum tube receiving socket secured to said support, an electrostatic pickup member formed as a component part of said socket, a vacuum tube detachably secured in said socket, and an adapter member connected to the said socket, said adapter member operatively connecting the vacuum tube to coating electric energizing and amplifying means.

7. In a device of the character described, the combination of a support, a socket secured to said support, a vacuum tube detachably mounted in said socket, an electrostatic pickup member formed as a component part of said socket, and an adapter member secured to the socket and

extensively arranged relatively to the support, said adapter member being engageable in a vacuum tube receiving socket of a radio set for operatively energizing said vacuum tube and conveying its electrical output to said radio set.

8. In a device of the character described, the combination of a support, a vacuum tube receiving socket formed on said support, a condenser mounted within said socket, said condenser having a movable element directly fastened to a stylus protruding exteriorly of said socket, a vacuum tube securable in the socket, and an adapter member extensively connected to said support and electrically connected to said vacuum tube and socket, whereby when the adapter member is engaged with a vacuum tube socket of a thermionic amplifier said vacuum tube may be energized and its electrical output conveyed to said thermionic amplifier.

9. In a device of the character described, the combination of a swingably mounted arm, a vacuum tube receiving socket secured to said arm, a cartridge condenser secured within said socket, a metal sleeve movably mounted on the exterior of said cartridge condenser and forming one of the charge-varying members thereof, a stylus pivotally secured to said socket for oscillation thereon and mechanically connected to said metal sleeve, a vacuum tube secured to said socket, and means mechanically connected to said arm and electrically connected to said condenser, socket and vacuum tube for energizing said vacuum tube and impressing a potential on said condenser, whereby when said stylus is oscillated electrostatic charges may be impressed on a grid electrode of said vacuum tube whose output is conveyed thence to a thermionic amplifier by said means.

10. A phonograph pickup comprising in combination, a member movably mounted on a support, an electron discharge device mounted on the member, pickup means secured to said member, and a transformer mechanically connected to the pickup means, said device being electrically connected to said pickup means and transformer.

11. A unit of the kind described comprising in combination, a phonograph pickup, a pivoted support for said pickup, and a coacting electron-discharge device having a plurality of electrodes within an envelope, said envelope having an exterior mechanical connection to said support, there being an electrical connection between said pickup and at least one of said electrodes.

12. A phonograph pickup comprising in combination, a member, a support for the member, said support being arranged to permit angular movement of the member, an electron-discharge device mounted on said member, and pickup means operably secured to the member, said pickup means having a reed electrically connected to said electron-discharge device.

13. A unit of the kind described comprising the combination with an electron discharge device having a plurality of electrodes arranged in an envelope and a base secured to said envelope; of phonograph pickup means mechanically connected to said base and electrically connected to at least one of said electrodes.

14. A unit of the kind described comprising in combination, an electron-discharge device provided with a plurality of electrodes and an envelope housing said electrodes, a base secured to said envelope, and phonograph pickup means arranged within said base, and means for electrically connecting the pickup to the electron discharge device.

15. A unit of the character described comprising in combination, a supporting arm, a phonograph pickup mounted on the arm, an electron-discharge device mechanically secured to the said arm and electrically connected to said pickup, and resistance means mounted on the arm and mechanically and electrically connected to the electron discharge device for controlling the output of the unit.

16. A unit of the character described comprising in combination, a socket, a pivoted support for the socket, electric pickup means secured to the socket, an electron-discharge device and a condenser mechanically secured to the socket and electrically connected to the pickup means, and other means mechanically arranged on said socket for conveying a biasing voltage across said condenser.

17. A unit of the character described comprising in combination, a socket, a pivoted support for said socket, electric pickup means mounted in the socket, an electron-discharge device mechanically secured to said socket and electrically connected to the pickup means, and means forming a mechanical part of said unit for coupling the output of said circuit of said electron discharge device to coacting electrical amplifying means.

18. A unit of the character described, comprising a socket, a pivoted support for said socket, electrical pickup means arranged within the socket, an electron-discharge device electrically connected to the pickup means and mounted on the socket, and other means forming a mechanical part of said unit for applying an available potential across the electrical pickup means for biasing the same.

19. A unit of the character described, comprising in combination, a socket, a pivoted support for the socket, electric phonograph pickup means arranged within said socket, an electron-discharge device mounted on the socket and electrically connected to the pickup means, and means within the socket for varying the electrical characteristics of the said unit.

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