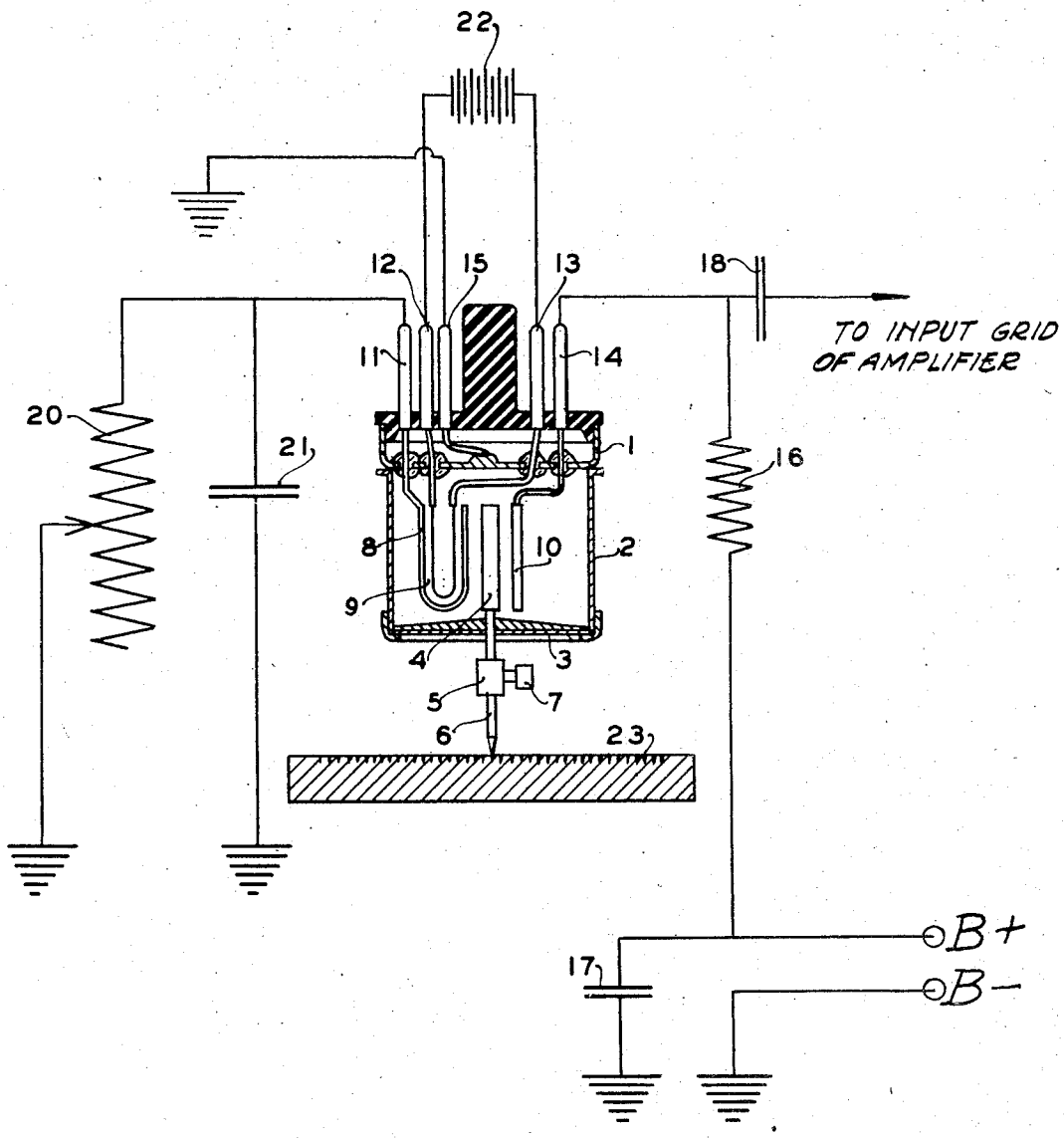
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ELECTRONIC PHONOGRAPH PICK-UP

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ELECTRONIC PHONOGRAPH PICK-UP

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This invention relates to phonograph pick-ups and more particularly to the provision of a new and improved thermionic tube having a stylus adapted to follow a sound track and so arranged as to convert the mechanical movement of the stylus into variations in an electric current.

Phonographic pick-ups previously used have not been entirely satisfactory for various reasons, which may be summarized in the statement that it has been difficult to make the diaphragm vibrate in exact accordance with the variations in the sound track so that the variations in the electric current through the pick-up have been entirely responsive to the recorded sound. One of the chief difficulties has been in producing a stylus and diaphragm capable of eliminating the scratching caused by the stylus tracking over the sound track. According to my invention I connect the stylus with an element of a thermionic tube in such a manner as to cause variation of the current flowing through the tube in accordance with the variations in the sound track.

It is an object of the invention to provide an electric pick-up for a phonograph which will produce variations in current exactly corresponding to the variations in the sound track.

It is a further object of the invention to produce an electric pick-up capable of completely eliminating the scratching sound without, in any way, affecting the volume of the recorded sound.

Other objects of the invention will appear from the following description and accompanying drawing, referring to which the figure is a diagram indicating the approximate mechanical construction and electrical connections of a device built in accordance with my invention.

The reference numeral 1 indicates the base of a thermionic tube having a vacuum chamber 2, preferably formed of metal. The end of the tube, opposite the base, is closed with a slightly flexible diaphragm 3 which is preferably made of thin steel or other suitable material. The vibration of the diaphragm is preferably damped by a coating of lead or rubber to avoid setting up a harmonic vibration due to its own inertia. The grid 4 is attached to the center of the diaphragm and extends through the diaphragm for attachment to a stylus retaining member 5 in which the conventional stylus or phonograph needle 6 is fixed by any suitable means, such as the set screw 7.

The thermionic tube is provided with a conventional cathode 8 which is heated by the filament 9. A plate 10 is also mounted in the vacuum chamber opposite the cathode. Suitable terminals are provided at the base of the tube, the terminal 11 being connected to the cathode, 12 and 13 to the filament, 14 to the plate and 15 to the ground. It will be understood that the grid 4 is grounded by reason of its connection to the steel diaphragm 3, the metallic vacuum chamber 2, and the base 1 which is grounded at 15.

A source of current which is indicated by the reference numerals B plus and B minus is provided for maintaining suitable charges on the cathodes and plate. This current may be derived from any desired source but preferably originates in the 110-volt A. C. line which is available everywhere. The plus terminal of the source B is connected through the plate resistance 16 to the terminal 14. A suitable condenser 17, having one grounded terminal, is also connected to the plus terminal of the source. The plate terminal 14 is connected to one terminal of the condenser 18, the other terminal of which is connected to the in-put grid of an amplifier 19.

The cathode terminal 11 is connected to a variable resistance 20, one terminal of which is grounded so as to form a connection with the grounded negative terminal of the source of current supplied B minus. A suitable condenser 21, one terminal of which is grounded, is also connected to the cathode terminal 11. Any desired source of current 22 may be used for heating the filament 9. It will be understood that many of the elements described herein are very well known and that they may be widely varied without departing from the scope of my invention which relates chiefly to the mechanical movement of any one or more of the electrical elements in the thermionic tube by means of a stylus or sound track, or other mechanical means.

In operation the cathode 8, being coated with a suitable radioactive material and heated by the filament 9 emits electrons or negative particles of electricity, which form a cloud around the cathode and tend to flow through the vacuum to the positively charged plate 10. The grid 4 is grounded as previously described and the effect of the variable resistance 20 connected in the lead to the cathode 8 gives the cathode a positive charge with respect to the grid. This is the same thing as saying that the grid 4 will become more negative with respect to the cathode 8 as the value of the variable resistance 20 increases. We can, therefore, control the volume of output through the cathode-grid circuit by varying the condition of the variable resistance 20.

The effect of the grid 4 is to resist the flow of electrons from the cathode 8 to the plate 10. Movement of the grid toward the cathode will in-

crease the flow of electrons while movement in the opposite direction will permit the flow to decrease. This movement is produced by running the stylus 6 in the sound track of a phonograph record or similar device as indicated at 23. It will be understood that this movement gives the stylus 6 a movement to the right or left with respect to Figure 1 turning the unitary stylus and grid about the center of the diaphragm 3, as a pivot so that the grid is moved toward and away from the cathode in accordance with the variations of the sound track. This, in turn, produces variations in the flow of current from the cathode to the plate and corresponding variations in the charge of the condenser 18 which are communicated through its connection to the amplifier 19. It will be noted that the up and down variations due to scraping of the needle on the bottom of the groove merely causing up and down movement of the grid which has no substantial effect on transmission of current from the cathode to the plate so that the well known scratching sound is substantially eliminated. It will also be understood that the use of the invention is not limited to a sound track with sideways variations because the use of the device can be adopted to up and down sound tracks by merely bending the stylus to the proper position.

It will be understood that variations in the construction of the above described device may be made by those skilled in the art and, accordingly, I do not wish to be limited in my protection except as indicated in the following claims.

I claim:

1. A thermionic tube having a vacuum chamber, grid, plate and cathode elements for said chamber, a part of the wall of said chamber being at least slightly flexible, one of said elements being connected to the flexible part of said wall and mechanical means for flexing said wall, and a layer of non-resilient solid material engaging said flexible wall part to damp vibration thereof.

2. A thermionic tube having a vacuum chamber, grid, plate and cathode elements for said chamber, a part of the wall of said chamber being at least slightly flexible, one of said elements being connected to the flexible part of said wall, and mechanical means for flexing said wall, that part of the flexible wall to which said element is attached being coated with a metal having great density and little elasticity.

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