

July 9, 1940.

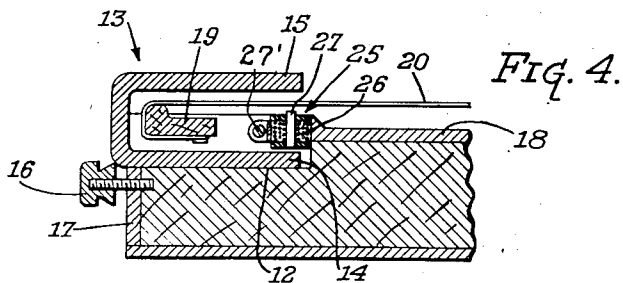
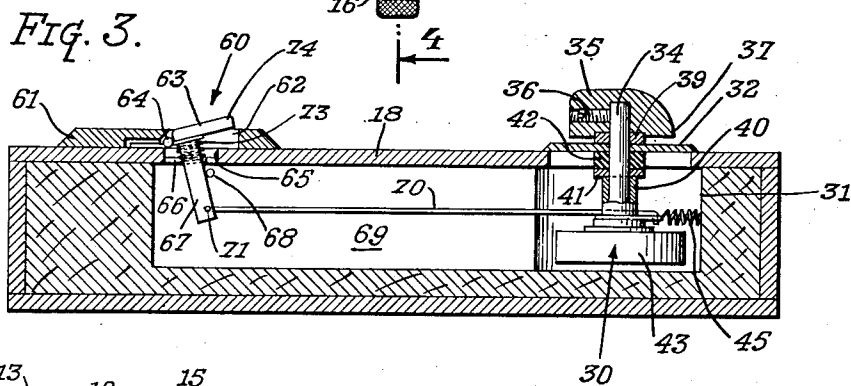
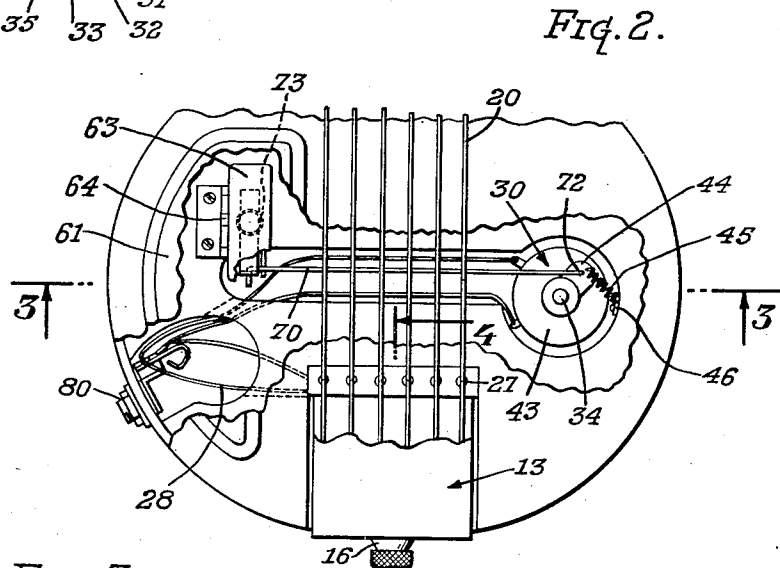
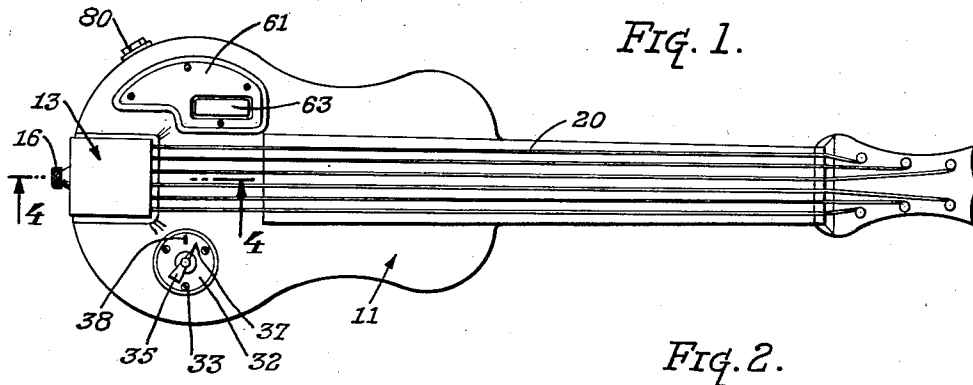
D. J. DICKERSON

2,207,341

ELECTRICALLY AMPLIFIED CONTROLLED STRINGED MUSICAL INSTRUMENT

Filed June 1, 1937

3 Sheets-Sheet 1



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Fig. 5.

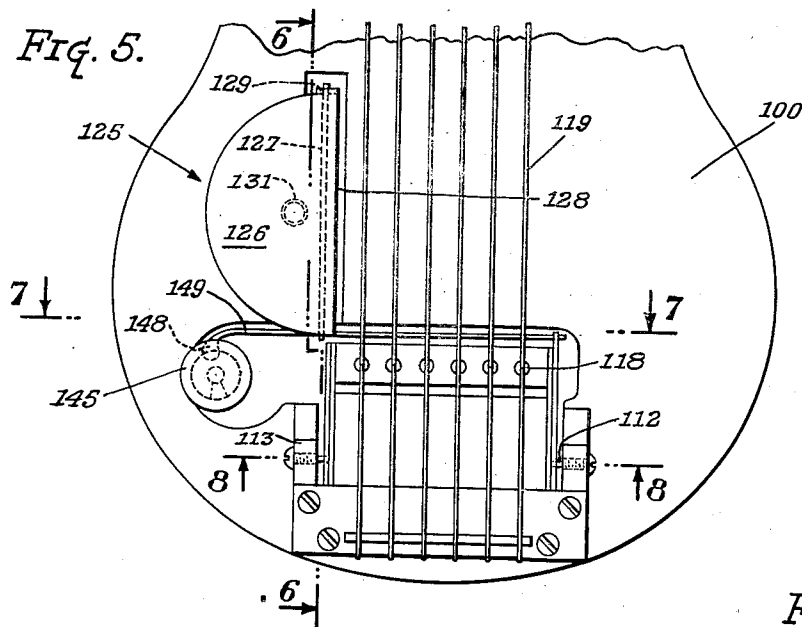


Fig. 6.

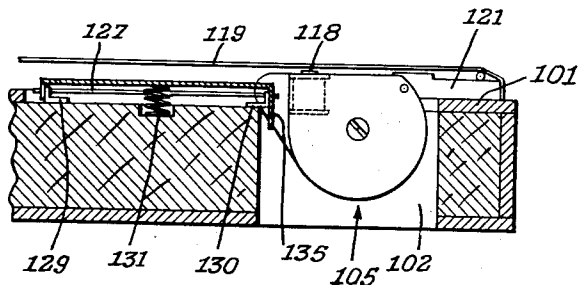


Fig. 7.

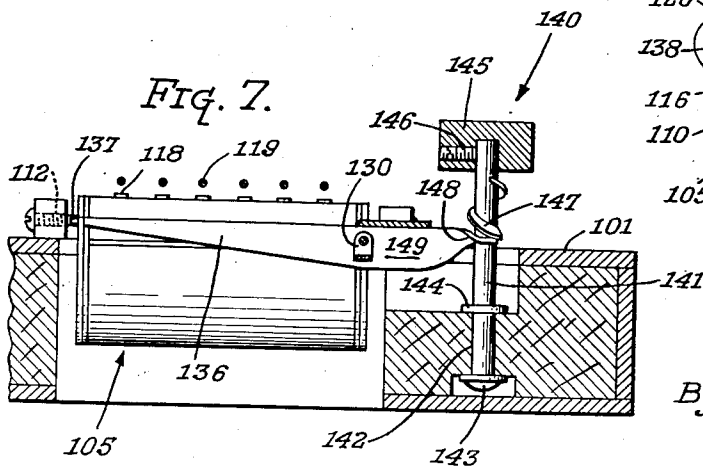


Fig. 8.

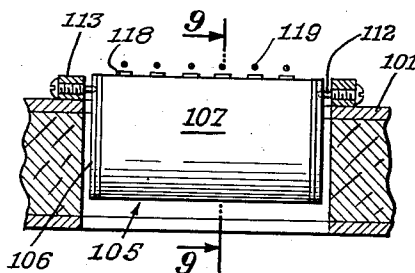
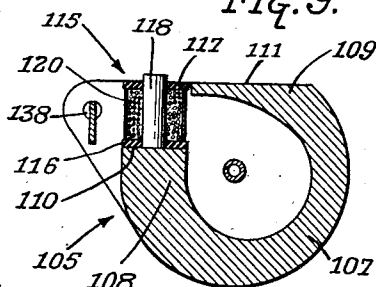


Fig. 9.



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3 Sheets-Sheet 3

Fig. 10.

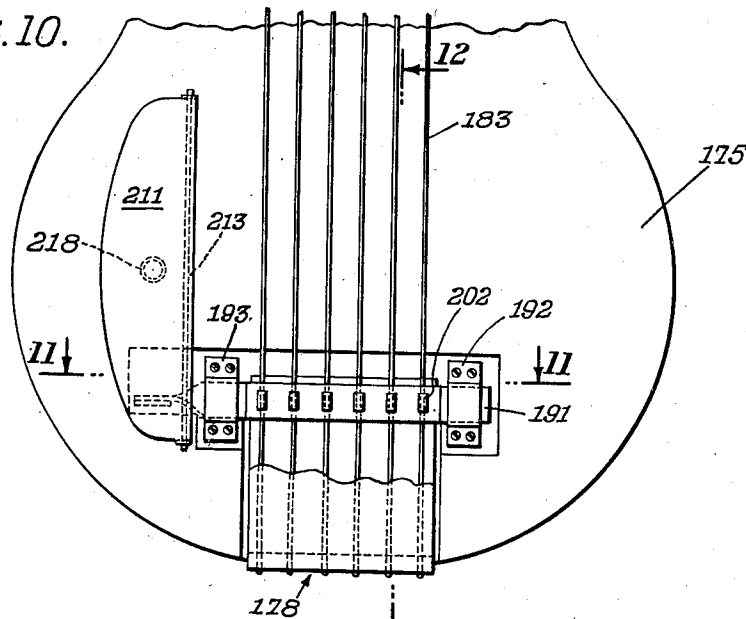


Fig. 11.

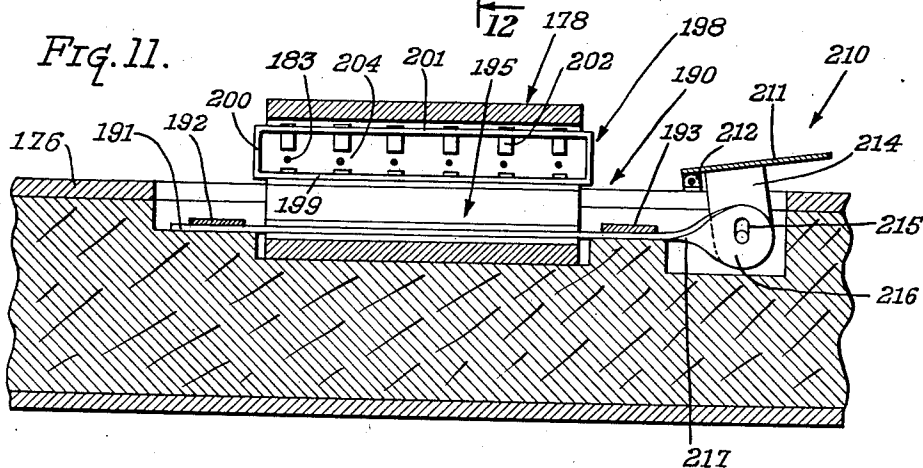
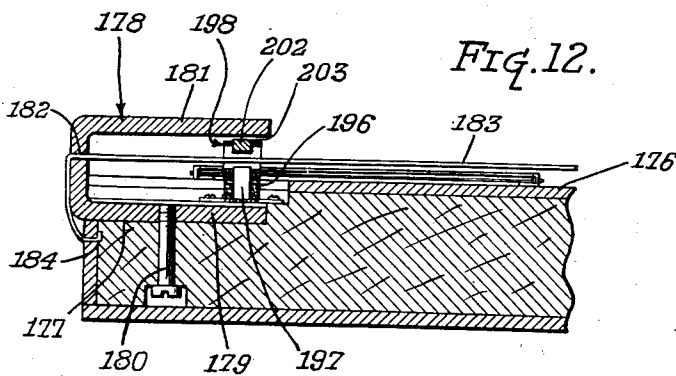


Fig. 12.



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UNITED STATES PATENT OFFICE

2,207,341

ELECTRICALLY AMPLIFIED CONTROLLED
STRINGED MUSICAL INSTRUMENTDelbert J. Dickerson, West Los Angeles, Calif.,
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Long Beach, Calif.

Application June 1, 1937, Serial No. 145,800

15 Claims. (Cl. 84-1.16)

My invention relates to the control or the electrical amplification of musical instruments which are held in the hands or possibly resting on the player's knee, such as guitars and similar type of instrument in contradistinction to large instruments of a piano type. In the smaller guitar type of instrument, various arrangements have been employed by which the electrical amplification may be controlled by the player and changed and varied to increase or decrease the amplitude of the sound without materially interrupting with the playing. However, some of these employ a rheostat type of control, the rheostat being built in the instrument box or case and having a controlled dial. In most of such instruments it is difficult for the player to operate such dial while playing the instrument, having either to place the hands in an awkward position to operate the dial and at the same time pluck the strings.

A main object and characteristic of my invention therefore resides in a control for the electrical amplification in which a movable device mounted on the instrument case may be engaged by the arm or wrist and shifted to various positions while the player's hand may be plucking the strings. Thus presuming the player is fingering the strings with the right hand, his right wrist or forearm may operate the movable control element.

My invention also comprehends various ways of changing the electric current generated by the vibration of the strings to the particular amplifying unit which varies the input to a loud speaker or the like. My invention therefore includes a rheostat control actuated by the movable device on the instrument case. Such case may have a standard type of rheostat with a dial for operating the same, which dial may be set by hand and then the auxiliary arm or wrist control may regulate the rheostat in order to change the electric current fed to the electrical amplifier.

My invention also includes changing the relative positions of the electro-magnet assembly in regard to the steel strings in which the permanent magnet having the individual electro-magnets for the various strings may be tilted on a longitudinal axis to vary the distance between the strings and the poles of the individual electro-magnets. The position of the magnet assembly may be set to have a limit and the change of position varied between these limits. This operation may be controlled by a movable, such as a pivoted, arm or wrist rest on the body of the instrument.

Another characteristic and type of my invention is changing the relative positions of the poles

of the electro-magnets in reference to the steel strings of the instrument. In this case the permanent magnet may be held stationary and the electro-magnets shifted to vary their position of proximity to the strings. This increases or decreases the path of the magnetic flux and thus causes a variation of the electric current. A simple arrangement is afforded by bodily sliding the electro-magnetic assembly with its individual poles for each string in reference to the strings. Therefore the poles of the electro-magnets may be shifted laterally in regard to the strings and the permanent magnet.

My invention is illustrated in connection with the accompanying drawings, in which:

Fig. 1 shows a plan of a guitar type of instrument showing the form of my invention employing a rheostat or an electric resistance device or the like controllable by dial or by a wrist or arm actuated device to vary the electric conductivity or the like of an electric element which may be connected to an electrically actuated amplifying device.

Fig. 2 is an enlarged partial plan similar to Fig. 1 partly broken away to show details of the rheostat or the like control.

Fig. 3 is a transverse section on the line 3-3 of Fig. 2 in the direction of the arrows.

Fig. 4 is a partial longitudinal section on the line 4-4 of Fig. 1.

Fig. 5 is a partial plan of a guitar type instrument showing a modified construction in which the permanent and electro-magnets may be tilted on pinions to vary the distance while maintaining the alignment between the poles of the electro-magnets and the assembly of strings, such section being partly broken away to illustrate the control by a tilting wrist or arm operated element.

Fig. 6 is a detail longitudinal section on the line 6-6 of Fig. 5 in the direction of the arrows.

Fig. 7 is a transverse section on the line 7-7 of Fig. 5 in the direction of the arrows.

Fig. 8 is a detail transverse section on the line 8-8 of Fig. 5 in the direction of the arrows through the main pintles of the magnet assembly.

Fig. 9 is a longitudinal section on the line 9-9 of Fig. 8 through the magnet assembly.

Fig. 10 is a plan of part of a guitar assembly showing a modified construction in which the assembly of electro-magnets is shifted laterally to vary the distance between the poles of the magnets and the strings of the instrument.

Fig. 11 is a transverse section taken on the line

11—11 of Fig. 10 in the direction of the arrows.

Fig. 12 is a longitudinal section on the line 12—12 of Fig. 10 in the direction of the arrows.

In the construction of Figs. 1, 2, 3 and 4, I illustrate a guitar or similar instrument body 11 which for the electrically amplified instruments is generally made of a more or less solid block instead of having a resonance chamber as in the ordinary type of guitar or like instruments. In this case at the end of the block there is a recess 12 in which is located the permanent magnet 13, this having a lower pole 14 and an upper pole 15. The magnet is held in place by a set screw 16 threaded in the end of the block, this extending through an ornamental covering material 17. The covering material at the top is indicated by the numeral 18. A substantial bridge 19 extends across the recess 12 and has the strings 20 of the guitar secured thereto. It will thus be seen that the lower pole 14 and the upper pole 15 are located below and above the strings. A more or less standard electro-magnet assembly 25 has a winding 26 and a series of individual pole pieces 27, there being one pole for each string and positioned directly below its string as illustrated in Fig. 2 held in place by a screw 27' at each end as shown in Fig. 4. Electric leads 28 extend from the coil to a rheostat assembly 30. This may be of a standard type and the interior mechanism is not illustrated. Such assembly is mounted in a cut-out sprocket 31 in the block 11. It includes a dialing disk 32 which is attached to the cover 18 by screws 33 or the like. A vertical shaft 34 extends downwardly through the center of the dial and has a finger operating knob 35 connected thereto by a set screw 36 at the top. This knob has a pointer end 37 and may be brought to engage a fixed stop 38 on the dial disk 32. A washer 39 spaces the knob from the top of the disk. A sleeve 40 is relatively rotatable on the shaft 34, this sleeve having a washer 41 thereabove and there being a rubber friction washer 42 between washer 41 and the underside of the dial disk 32. The sleeve is connected to a drum-like housing 43, there being a radial arm 44 connected to the sleeve and a retraction spring 45 connected to this arm and to a fixed attaching device 46 on the inside of the socket 31. This tends to hold the drum in a fixed position. The shaft 34 extends into the drum and between the shaft and the drum there is a rheostat assembly which is standard equipment and does not form part of my present invention as many different types of rheostats of this nature may be utilized. One of the rheostat assemblies which I use is manufactured by the Central Laboratory and is quite well known on the market. However, as the rheostat itself forms no part of my invention I may employ a rheostat of the type shown in the Stimson Patent No. 1,962,919 as element 57; in the Stimson Patent No. 2,078,350 as element 49 and in the Beauchamp Patent No. 2,089,171 as element 43.

The control for the rheostat while playing is indicated by the assembly numeral 60. This employs a raised cover piece 61 secured to the ornamental top 18 or extending thereabove, this having an opening 62. A wrist actuated lever 63 is formed of a plate having a fulcrum or hinge 64 at one side of the opening 62, this being the side remote from the strings. A recess 65 is formed in the top and this has a slot 66 through which extends an operating arm 67 attached to the bottom of the plate 63. A stop pin 68 is secured to one or both sides of a transverse deep

groove 69 extending across the block 11 and joining the socket 31. This is to accommodate an actuating link 70 secured at 71 to the arm 67 and at 72 to the arm 44. One or more coil springs 73 engage the block 11, passing through a cut-out section on the ornamental top 18 and normally tends to elevate the outer edge 74 of the plate 63.

The manner of operating the device of Figs. 1 through 4, as above mentioned, is by the spring 45 operating through the arm 44, the sleeve 40 and the drum or housing 43 holds this housing in one position which may be designated as the initial position. The knob 35 may then be rotated which changes the rheostat until for instance a desired volume of tone is obtained. Should the player desire to change the tone entirely by the knob 35 he may do so provided he does not operate the hinge plate 63. Where however he intends to effect a further control by such plate, the knob 35 may be turned until a suitable amplitude of sound is developed, this being however preferably the softest or quietest tone desired. Then while the player is playing the instrument with the fingers, for instance the fingers of the right hand being used to pluck the strings, the underside of the wrist may rest lightly on the pivoted plate 63 and the raised section 61 of the ornamental top. Then by increasing the pressure on the plate 63 this is depressed, moving the arm 67 to the left of Fig. 2 and exerting a pull on the link 70 which moves the arm 44 against the tension of the spring 45. On account of the friction developed by the friction washer 42 and the washer 39 on opposite sides of the dial disk 32 and this washer engaging the shaft 34 with friction, the shaft and hence the knob 35 are retained from movement and the movement is developed in the drum or housing 43 while the shaft and the portions of the rheostat connected thereto are held stationary. This changes the electrical conductivity of the rheostat assembly and hence varies the strength of the electrical impulses which by suitable wiring connect to a radio type of amplifier. A jack connection 80 is used for connection to the amplifier. It will thus be seen that the rheostat may be controlled either by the finger knob 35 or by the hinged plate 63 while the player is playing the instrument or may be controlled by both, thus changing the amplitude of the sound from a loud speaker or the like.

In the construction illustrated in Figs. 5 through 9 inclusive, a portion of the guitar body is indicated by the numeral 100. This has an ornamental cover or finished surface 101 and is provided with a deep recess or opening 102. A permanent magnet assembly 105 has two opposite end plates 106 with U shaped magnet 107 fitted therebetween. The magnet has a lower pole 108 and an upper pole 109, the lower pole having a flattened upper surface 110 and the upper pole having a beveled surface 111. The magnet assembly is journaled on pintles 112 secured in journal blocks 113. Such pintles may be screw pins engaging in perforations in the end plates 106. The electro-magnet assembly 115 has lower and upper plates 116 and 117 with a series of poles 118 extending through these plates and extending slightly above the upper plate. Each pole is in alignment with a string 119, there being one pole thus directly below each string. The electromagnetic winding 120 forms a coil around the magnet assemblies, these thus being of a usual type. The strings are secured in any suit-

able manner as by a bridging piece 121 and the leads from the magnet extend to a jack receiving socket such as shown in Fig. 1.

The tilting mechanism for the wrist control designated by the assembly numeral 125 employs a wrist engaging plate 126 having a hinge with a pintle pin 127 adjacent the edge 128 which is contiguous to the strings, the pintle being mounted in end journals 129 and 130. A coil compression spring 131 is seated in a recess in the block 100 and engages the underside of the plate 126. The plate at one side has a downwardly turned arm 135 through which the pintle pin 127 extends. This arm has a forward extension 136 which has its tip end 137 engaged in a perforation 138 on the plate 106 of the magnet assembly on the side opposite the plate 126. The compression of the spring 131 is such that it normally tilts the magnet assembly downwardly, that is, depresses the outer tip 137 of the arm 135 so that normally under the tension of such spring the poles 118 are spaced a maximum distance from the strings.

A limiting manual control designated by the numeral 140 employs a shaft 141 which extends through the block 100 being journaled in a perforation 142 and held in place by a riveted end 143 with a washer and preferably a pressed washer 144. This shaft has a finger operating knob 145 at the top attached to the shaft by a set screw 146. A helical or similar shaped screw 147 is secured to the shaft 141 and extends outwardly therefrom to contact an offset bent end 148 of a rearward extension 149 of the arm 135. Thus by adjusting the knob 145 and hence the screw 147, the arm 135 and the plate 126 may be tilted on the pintle 127. This may be used to give a manual adjustment of the position of the electro-magnet poles and the permanent magnet in reference to the strings or to form a limit to the drop or spacing apart of the magnets from the strings. When this is done, then any pressure by the wrist on the plate 126 operates to tilt the electro-magnets upwardly to bring them in closer relationship to the strings. Manifestly this shortens the distance between the poles and the strings and thus increases the strength of the electro-magnetic field and hence of the current through the electro-magnet winding. Therefore when the instrumentalist is playing he may at will by pressing on the plate 126 vary the position of the electro-magnet poles from the strings, thus by change of the magnetic lines of force vary the electric current through the magnets and hence the current delivered to a radio type of loud speaker, the change being manifested in the volume of sound from a loud speaker or the like.

In the form of my invention illustrated in Figs. 10, 11 and 12, the instrument block 175 has an ornamental cover 176. At one end there is a recess 177 in which is fitted a U shaped permanent magnet 178. This has its lower arm 179 clamped to the base of the recess by a clamping bolt 180. The upper arm 181 of the magnet extends above the top of the instrument. There are a series of perforations 182 through the end of the magnet and through such perforations extend the strings 183. These may have their ends attached as indicated at 184 to the block in a suitable manner. The strings are thus positioned substantially midway between the lower and upper poles of the permanent magnet.

The slidable electro-magnet assembly 190 employs a slidable strap 191 which is mounted in guide bearings 192 and 193 secured to the instrument block. The strap has a slight clearance

above the lower pole 179 of the magnet. Mounted on this strap is the electro-magnet assembly 195. This assembly has a winding 196 and a series of lower permanent poles 197. A frame 198 of non-magnetic material such as copper strap has a lower bar 199 secured to the top of the electro-magnet assembly 195 from which opposite side pieces 200 extend upwardly and there is an upper strap or bar 201 connecting the sides, this having a clearance below the upper pole 181 of the permanent magnet. A series of complementary pole pieces 202 formed of magnetizable metal are secured to the cross bar 201, by providing the bar with a series of perforations 203 and the complementary pole pieces each extend through an opening 203 and are secured by riveting or swaging. It will thus be seen that this construction leaves a space 204 between the lower poles 197 around which is coiled the wire forming the winding 196 and the upper or complementary pole pieces 202, the strings being positioned between these poles as illustrated particularly in Fig. 11.

The manual control to obtain a sliding movement of the electro-magnets and their associated pole pieces designated by the assembly numeral 210 includes a wrist or arm actuated plate 211 having a hinge connection 212 with a pintle 213 to the body of the instrument. An arm 214 extends downwardly from the underside of the plate and has a pin and slot connection 215 with the end 216 of the strap 191, such strap having a quarter turn 217 so that the end is upright. A coil spring 218 engages underneath the plate 211 and the instrument block 175 or the ornamental cover 176 thereof. Although the strap 191 can only move with a rectilinear motion transversely of the instrument and of the wires and although the arm 214 moves in an arcuate path, the pin and slot connection 215 accommodates the connection between the arm and the strap.

In the manner of operation of the invention of Figs. 10, 11 and 12, when the poles 197 and the complementary pole pieces 202 are in direct alignment, each pair with a string 183, there is the greatest magnetic flux between these poles and hence in the vibration of the strings the greatest electric current is developed in the coil of the electro-magnet. In this position the wrist operated plate 211 is tilted upwardly under the action of the compression spring 218 and by a slight depression or tilting downwardly of this plate a transverse movement is given to the strap 191 and hence to the electro-magnet assembly with its poles slightly shifting these to one side in reference to the strings. This slightly moves the poles 197 and complementary pole pieces 202 away from the direct line through the strings so that the strings are no longer in the path of the greatest magnetic flux. Therefore the electric current in the electro-magnet coil is decreased. Manifestly by operating the plate 211 the lateral shift of the electro-magnet with its pull pieces may be obtained and hence the intensity of the electric current generated may be varied which manifests itself in the amplitude of the sound from the loud speaker operated through a radio type of amplification. It will be seen therefore that in the construction of Figs. 10, 11 and 12 as in Figs. 5 through 9, due to a change in magnetic field in reference to the strings, a change or fluctuation may be developed in the electro-magnets and hence a change in the amplitude of the sound from a loud speaker.

Various changes may be made in the details of

the construction without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

5 1. In a stringed musical instrument in which a plurality of strings are positioned to be plucked by the fingers of a player and in which the instrument is provided with an electro-magnet having an individual pole adjacent each string
10 and an electric winding for transmission of electric current therethrough, the combination of a movable control device mounted on the instrument and positioned approximate the strings to be engaged by part of the arm, the fingers of
15 which pluck the strings, with means actuated by the control device to increase or decrease the electric current through the electro-magnet whereby on amplifying such current and translating into sound, the amplitude of the sound may thus be
20 increased or decreased, the means actuated by the control device including a slidable mounting for the electro-magnet whereby the poles may be shifted laterally relative to the strings to dis-
25 place the poles offset or in alignment with the strings.

2. In a stringed musical instrument in which an instrument body is provided with a plurality of strings positioned to be plucked by the fingers
30 of the player whose arm is adapted to extend over part of the instrument body approximate the strings and in which an electro-magnetic assembly with a winding for transmission of electric current is positioned in the instrument body
35 adjacent to the strings, the combination of a movable control device mounted on the said body on the side of the assembly of strings over which the player's arm is adapted to contact and move, a movable member actuated by the control device
40 and having means to increase or decrease the electric current through the electro-magnet whereby on amplifying such current and translating into sound the amplitude of the sound may be increased or decreased, the movable
45 member including a fixed permanent magnet and an electro-magnet assembly mounted for sliding movement transverse to the assembly of strings, the electro-magnet assembly having a pole piece one for each string and an interconnection between the control device and the electro-magnet
50 assembly for shifting said assembly transverse to the strings to vary the distance between each pole piece and its individual string.

3. In a stringed musical instrument in which an instrument body is provided with a plurality
55 of strings positioned to be plucked by the fingers of the player whose playing arm is adapted to extend over part of the instrument body and in which an electro-magnetic assembly has a permanent magnet and a winding for transmission of
60 electric current with a pole piece associated with each string combined with a movable control device mounted on the said body on the side of the assembly of strings over which the player's arm is adapted to move and a connection from
65 the control device to at least part of the electro-magnetic assembly operative to vary the distance between the pole pieces and the strings with which they are associated, the permanent magnet being somewhat U shaped and having the
70 winding with the individual pole pieces mounted on one pole of the magnet, the magnet being journaled on pivots transverse to the strings whereby the magnet with the winding and pole
75 pieces may be oscillated in an arc to vary the dis-

tance between each pole piece and its associated string in the same plane.

4. A musical instrument having a plurality of strings for emitting different tones, an electro-magnet assembly having an individual pole adjacent each string and an electric winding for
5 transmission of electric current therethrough combined with a control device positioned to be actuated by the player of the instrument, the electro-magnet and the poles having a movable
10 mounting in the body for sound amplitude variation, a connection from the control device to the electro-magnet assembly to vary the distance between the poles and the respective strings to thereby increase or decrease the electric current
15 resulting from the vibration of each string during the playing of the instrument whereby on amplifying such current and translating into sound, the amplitude of sound may thus be in-
20 creased or decreased.

5. A musical instrument as claimed in claim 4, the electro-magnet assembly being shiftable whereby when actuated by the control device the distance from the poles to the strings is varied while maintaining each pole and its respective
25 string in the same plane.

6. A musical instrument as claimed in claim 4, the electro-magnet assembly having a pivotal mounting in the instrument and the connection from the control device oscillating the electro-magnet assembly on its pivot to thereby vary the
30 distance of the poles from the strings while maintaining each pole and its respective string in the same plane.

7. A musical instrument as claimed in claim 4, a part at least of the electro-magnet assembly including the poles being slidably mounted in the instrument and a connection from the control device to the sliding part of the electro-magnet
35 assembly sliding such assembly part bodily and thereby shifting each pole laterally from the position of alignment with its respective string.

8. In a stringed musical instrument of the guitar type, the combination of a control device with a lever plate fulcrumed to the instrument
45 by a pintle parallel to the top face of the instrument and also substantially parallel to the set of strings on one side thereof, a spring means normally inclining the plate relative to the top face of the instrument whereby by engaging the
50 lever with the forearm, the fingers of which pluck the strings, said plate may be rotated on its pintle, an electro-magnetic pick-up on the instrument and means connecting the lever plate and the pick up for varying the electric current
55 for amplification and transition into sound of changing amplitude.

9. An electro-magnetic pick-up assembly for stringed musical instruments comprising an electro-magnet with poles each adapted for association
60 with a particular string, a pivoting mounting means for attachment to the instrument with its pintle transverse to the assembly of strings and means to rotate the magnet to position the poles in close proximity to the strings or remote
65 therefrom.

10. An electro-magnetic pick-up assembly for stringed musical instruments including a permanent magnet with electrically wound pole pieces adapted for mounting on the instrument
70 with each pole piece associated with a particular string and means to vary the distances between each pole piece and its associated string, the wound pole pieces and magnet being rigidly at-
75 tached, the mounting on the instrument having

a pivot to rotate the magnet and its wound pole pieces in reference to the strings while retaining each pole piece and its associated string in the same plane.

5 11. An electro-magnetic pick-up assembly for stringed musical instruments including a permanent magnet with electrically wound pole pieces adapted for mounting on the instrument with each pole piece associated with a particular string and means to vary the distances between 10 each pole piece and its associated string, the magnet having a fixed mounting on the instrument and the wound pole pieces being movable transversely of the string to laterally displace 15 each pole piece from the closest position to its associated string.

12. In an electro-magnetic pick-up assembly for stringed musical instruments, the combination of a magnet with a set of electrically wound 20 pole pieces adapted for mounting on the instrument with each pole piece associated with a particular string, a control device with a lever plate fulcrumed to the instrument by a pintle parallel to the top face of the instrument and also substantially parallel to the set of strings at one 25 side thereof, a spring means normally inclining the plate relative to the top face of the instrument, the lever plate being positioned to be engaged by the forearm, the fingers of which 30 pluck the strings to rotate the plate on its pintle and a connection between the lever plate and the set of pole pieces to move at least the pole pieces to vary the distance between each pole piece and its associated string.

35 13. In an electro-magnetic pick-up assembly for stringed musical instruments, the combination of a substantially U shaped permanent magnet, a set of electrically wound pole pieces on one pole of the permanent magnet, means for 40 pivotally mounting the permanent magnet on the instrument to align each pole piece and an associated string and means for tilting the permanent magnet and set of pole pieces on the piv-

oted mounting to vary the spacing of each pole piece and its associated string while maintaining each pole piece and its associated string in the same plane.

14. In an electro-magnetic pick-up assembly 5 for stringed musical instruments, the combination of a substantially U shaped permanent magnet, a set of electrically wound pole pieces on one pole of the permanent magnet, means 10 for pivotally mounting the permanent magnet on the instrument to align each pole piece and an associated string and means for tilting the permanent magnet and set of pole pieces on the 15 pivoted mounting to vary the spacing of each pole piece and its associated string while maintaining each pole piece and its associated string in the same plane, said tilting means comprising 20 a lever plate fulcrumed to the instrument by a pintle parallel to the top face of the instrument and also substantially parallel to the set of strings at one side thereof, a spring means 25 normally inclining the plate relative to the top face of the instrument, the lever being positioned to be engaged by the forearm, the fingers of which pluck the strings to rotate the plate on 30 its pintle and a connection between the lever plate and the permanent magnet whereby the magnet and pole pieces may be tilted on the 35 pivoted mounting.

15. In an electro-magnetic pick-up assembly 30 for stringed musical instruments, the combination of a substantially U shaped permanent magnet with poles, means to fixedly attach the permanent magnet to the instrument, a frame slidably mounted between the poles of the permanent 35 magnet, a set of electrically wound pole pieces mounted in the frame adapted each for aligning with its associated string, the frame being adapted for sliding transversely to the assembly of strings to change the spacing between each 40 pole piece and its associated string.

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