Feb. 9, 1943. G. D. BEAUCHAMP 2,310,199

STRINGED MUSICAL INSTRUMENT

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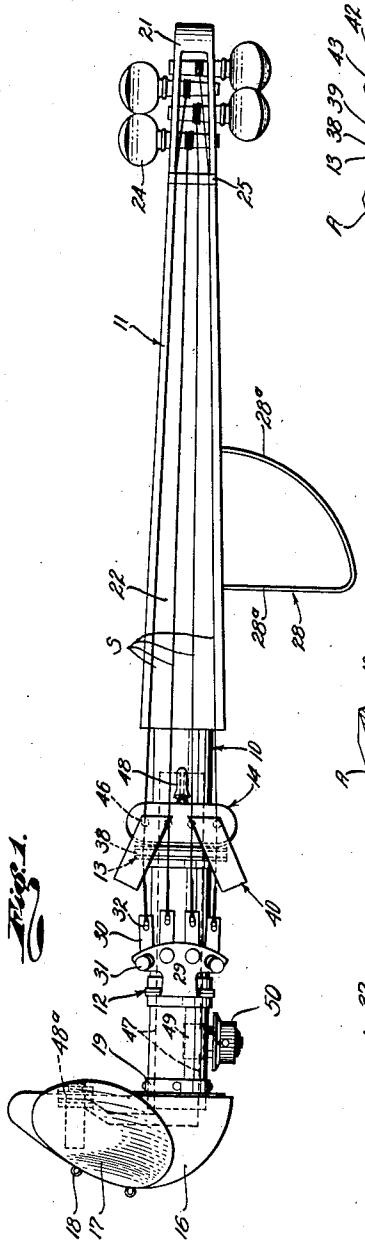

Fig. 1.

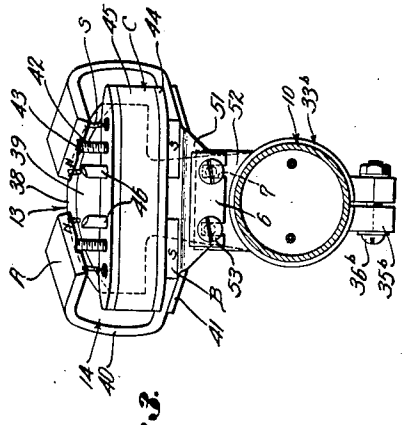

Fig. 3.

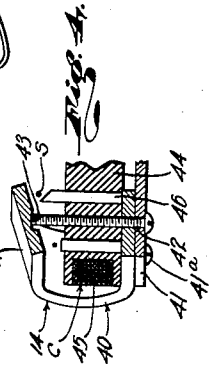

Fig. 4.

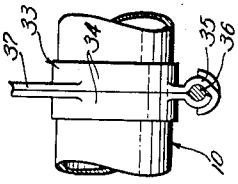

Fig. 5.

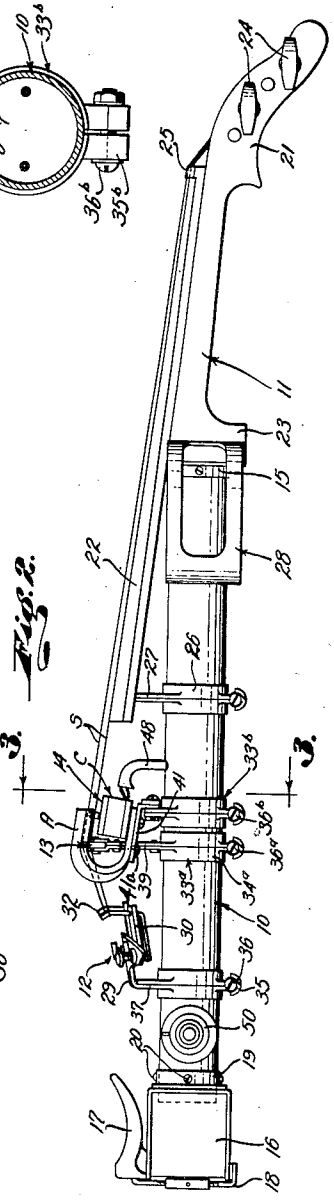

Fig. 2.

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STRINGED MUSICAL INSTRUMENT

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4 Claims. (Cl. 84—1.15)

This invention relates to musical instruments and relates more particularly to electrical musical instruments of the violin class, such as violins, violas, cellos, bass viols, etc. A general object of this invention is to provide a compact, easily played and effective electrical musical instrument of the violin class.

Another object of this invention is to provide an improved electrical stringed musical instrument embodying an electric pick-up means for converting vibrations of the strings into modulations of an electrical circuit suitable for amplification and reproduction as sound or music, said instrument being simple in shape and design and devoid of the cumbersome, resonant body usually present in this type of instrument.

Another object of this invention is to provide an electrical stringed instrument of the character mentioned in which the body is a simple, elongate tubular member that is light in weight and easily handled.

Another object of this invention is to provide an electrical stringed instrument of the character referred to in which the electrical pick-up is small and compact and does not have large or projecting parts that interfere with the "bowing" of the strings or the playing of the instrument.

Another object of this invention is to provide a stringed musical instrument of the character referred to in which the tail piece, the bridge and the electrical pick-up means are individually or separately adjustable along the body and the body is extensible and contractible to obtain an accurate adjustment or relation of parts and to change the pitch of the instrument.

Another object of this invention is to provide an electrical musical instrument of the character referred to that is simple and inexpensive to manufacture.

A further object of this invention is to provide an electromagnetic pick-up for a stringed musical instrument embodying magnets arranged in the most advantageous relation to the strings and the pole pieces and arranged so that they do not interfere with the bowing, plucking or picking of the strings.

The various objects and features of my invention will be fully understood from the following detailed description of a typical, preferred form and application of the invention, throughout which description reference is made to the accompanying drawing, in which:

Fig. 1 is a plan view of the instrument of the invention. Fig. 2 is a side view of the instrument. Fig. 3 is an enlarged vertical detailed sectional view taken as indicated by line 3—3 on Fig. 2. Fig. 4 is an enlarged fragmentary vertical detailed sectional view of the pick-up means, and Fig. 5 is an enlarged fragmentary side elevation illustrating one of the adjustable mountings.

The improved electrical musical instrument of the present invention may be said to comprise, generally, an elongate body 10, a neck 11 on the body, a tail-piece 12 adjustable along the body, strings S anchored to the tail-piece 12 and stretched across the body 10 and the neck 11, a bridge 13 for the strings S adjustable along the body 10, and an electro-magnetic pick-up 14 adjustable along the body 10 and operable to convert vibrations of the strings S into modulations or pulsations into an electrical amplifying and reproducing circuit.

The body forms the carrier or support for the other parts of the instrument and in accordance with the invention is a simple, light-weight element. As illustrated the body 10 may be an elongate tubular member and may be formed of metal, a plastic, or any other selected material. The body 10 may be cylindrical or of any other regular shape to be readily finished, etc. A flange or flanged collar 15 is fixed to the outer end of the body 10. A shoulder piece or shoulder part 16 is provided on the inner end of the body 10. The shoulder part 16 is hollow and formed to be light in weight. In practice the shoulder piece 16 may be formed of a plastic material, sheet metal, or the like. The shoulder piece 16 has flat upper and lower sides, a curved or convex outer face and a flat forward face. A suitable chin rest 17 is secured to the upper side of the shoulder part 16 by clamps 18. In the preferred construction the body 10 and the shoulder part 16 are connected or related for relative adjustment so that the body assembly may be extended or contracted at will. A collar or flange 19 projects from the forward face of the shoulder piece 16 and slidably or shiftably receives the inner portion of the body 10. The body 10 may be shifted or adjusted through the flange 19 to change the length of the body assembly and set screws 20, or the equivalent, may be employed to secure the parts against movement in the selected adjusted relation.

The neck 11 is secured to the outer end of the body 10 and carries or includes a peg box portion 21 and a fingerboard 22. The neck 11 may be of conventional shape and formed of wood or the like. A downwardly extending enlargement 23 is formed on the under side of the neck 11 and is secured to the body collar 15 by screws, or the like. The key or peg box portion 21 is

a downwardly and outwardly curved continuation of the neck 11 and carries the usual string-tensioning keys or pegs 24. The fingerboard 22 extends longitudinally under the portions of the strings S to be fingered by the musician. The fingerboard 22 is secured to or formed integral with the upper portion of the neck 11 and extends longitudinally in pitched or inclined relation to the body 10. The fingerboard 22 continues inwardly or rearwardly over a portion of the body 10 and presents a convex upper surface. A notched bridge 25 is provided at the outer end of the fingerboard 22 to receive and support the strings S. It may be desired to support the projecting rear portion of the fingerboard 22 on the body 10. A split collar 26 is arranged on the body 10 below the projecting portion of the fingerboard 22 and has an upstanding web or broad post 27 engaging under and secured to the fingerboard to support and brace the same. The neck 11 with the peg box portion 21 and the fingerboard 22 forms a unit readily attachable to the body 10.

Means may be provided to support and locate the fingering hand of the musician. A rest 28 may be secured to the outer portion of the body 10 to project laterally therefrom. The rest 28 may be formed of sheet metal or the like to have spaced arms 28a. The arms 28a are suitably secured to the body 10. In practice the forward or outer arm 28a may be held between the outer end of the body 10 and the projection 23 of the neck 11. The forward arm 28a is curved to present a forwardly and laterally facing convex surface for resting, supporting and locating the musician's hand. The rest 28 serves to replace the forward portion of the resonant body of a typical violin which is often used to orient and support the musician's hand.

The tail piece 12 is secured to the inner portion of the body 10 to anchor the strings S. The invention is not primarily concerned with the type or character of the tailpiece employed but it is a feature of the invention that the tailpiece is secured to the body 10 for adjustment along the body. The tailpiece 12 illustrated comprises a pitched, arcuate or curved plate 29 spaced from and projecting toward the bridge 13. Fingers 30 are secured to the under side of the plate 29 by screws 31 and project forwardly to carry anchor pins 32 for the ends of the strings S. The screws 31 serve as adjusting means for the fingers 30 and their pins 32.

The means for adjustably securing the tailpiece 12 to the body 10 is such that the tailpiece may be shifted longitudinally of the body and secured in any selected or required position. The means for adjustably supporting the tail-piece 12 includes a split sleeve or collar 33 surrounding the body 10 and carrying the plate 29, see Fig. 5. The collar 33 is sectional, including two rings 34 arranged in abutting end to end relation. The rings 34 are split in a common axial plane at their under sides and are provided with tubular lugs 35 at opposite sides of their axial openings or splits. The lugs 35 may be formed by curling or bending parts of the rings 34 in opposite directions and in overlapping relation. A pin or screw 36 is passed through the aligned tubular lugs 36 and a nut is threaded on the end of the screw. By tightening the screw 36 the split rings 34 are tightened on the body 10. The rings 34 have upwardly projecting arms or posts 37. The post 37 of one ring 34 is connected to or formed integral with the plate 29 while the post of the other ring operates as a brace or support for the first post. To adjust the tail piece 12 longitudinally of the body 10 the screw 36 is loosened and the collar 33 is slid along the body 10. The screw 36 is then tightened to hold or secure the tail piece 12 in the selected position.

The strings S are anchored to the pins 32 of the tail piece 12 as above described and extend longitudinally across the body 10 and the finger board 22 to the pegs 24. The pegs 24 may be turned to tune or tension the strings. The strings S are formed in whole or in part of steel or other magnetic material to influence the electrical pick-up 13. In accordance with the usual practice the strings S are graduated in weight or diameter, there being a heavy string at one side of the string series and a light string at the opposite side of the series. The strings S bear on the bridge 25 and the bridge 13 and the effective vibrating tone producing portions of the strings are defined by the spaced bridges.

The bridge 13 is adjustably supported on the body 10 in spaced adjacent relation to the tail piece 12. The bridge 13 comprises a part 38 of fiber or the like presenting a convex upper edge provided with suitable notches for receiving the strings S. The strings S engaged on the convex bridge part 38 are held in an arcuate or convex series as they extend across the convex fingerboard 22. The bridge part 38 is secured between the spread upper portions of a pair of plates 39. The plates 39 extend downwardly to and join or connect with split clamp rings 34a surrounding the body. The plates 39 may be riveted together to prevent vibration. The rings 34a may be identical with the rings 34 and are contractible by a screw 36a passed through tubular lugs. By loosening the screw 36a the rings 34a may be adjusted along the body 10 to vary the effective length of the strings S. The above mentioned collar 26 may be similar to or identical with the collar 33.

The electrical pick-up 14 serves to convert the actual tone producing vibrations of the strings S into modulations or pulsations in an electrical circuit that may be connected with a suitable amplifying and sound reproducing means for reproduction as sound or music. As amplifying circuits and sound reproducing circuits of the type employed with electrical musical instruments are well known to those skilled in this art these elements have been omitted from the present disclosure. The electrical pick-up 14 is an electromagnetic means providing a magnetic field that is influenced or affected by vibrations of the strings S and the flux of the magnetic field is impressed on an induction coil C to produce a modulated current suitable for amplification by the amplifying circuit.

The electrical pick-up 14 includes a pair of magnets 40 arranged to provide the said magnetic field. The magnets 40 are U-shaped or horse-shoe shaped. The magnets 40 are preferably alike and are arranged with their spaced arms in generally horizontal planes above and below the series of strings S. As illustrated, each magnet 40 has an arm A spaced above the series of strings S and an arm B spaced below the series of strings S. The magnets 40 are preferably permanent magnets so that they do not produce a hum or undesirable sound in the reproduced or electrically converted music. The polar relation of the magnets 40 may be as indicated in the drawings. In order to assure the efficient opera-

tion of the pick-up 14 the magnet arms A and B are of substantial length.

It is a feature of the invention that the magnets 14 are arranged so that they may be of ample size and length and yet not project an excessive distance from the instrument to form hazards or to interfere with the free bowing or plucking of the strings S. The magnets 40 are arranged in outwardly or forwardly convergent relation, that is, they are arranged so that their arms face forwardly as well as inwardly. This brings the joined or connected outer ends of the magnets in close relation to the sides of the body 10 and the magnets protrude from the instrument to a minimum extent. The upper arms A of the magnets 40 are twisted or pitched relative to the horizontal so that their active ends or pole portions lie in upwardly convergent planes to be substantially equi-distant from the adjacent strings S of the arcuate series. This twisting or pitching of the arms A makes the spacing of the magnet arms of the strings S substantially equal throughout the curved or arcuate series of strings. The pole ends of the magnet arms A are preferably pitched with respect to the longitudinal axis of the magnets to lie in a common vertical plane transverse of the strings S. The parts are related so that two strings S pass under the end of each arm A and in the preferred construction illustrated a string S passes under each corner portion of each arm A.

The means for supporting the magnets 40 of the pick-up 14 includes a plate 41 engaging under the lower magnet arms B. Bolts or screws 41[a] secure the lower arms B to the plate 41. Screws 42 of non-magnetic material pass upwardly through openings in the plate 41 and the lower arms B to assist in securing the magnets 40 to the plate and to hold the coil in place. Notches 43 are formed in the under sides of the upper arms A and the ends of the screws 42 engage in the notches 43. The screws 42 firmly engage in the notches 43 to prevent vibration of the magnets. If desired the screws 42 may be employed to raise or adjust the upper magnet arms A.

The coil C of the pick-up 14 is arranged under the series of strings S and is between the arms A and B of the magnets 40. The coil C comprises a spool or core 44 of suitable dielectric or insulation and a winding 45 on the core. The core 44 is horizontally elongated and is arranged with its major transverse axis transverse of the series of strings S. The winding 45 may be suitable enameled wire of the proper gauge and is wound on the core 44 between its upper and lower flanges. The number of turns and the gauge of the wire constituting the winding 45 depend upon the character of the amplifying circuit to be used with the instrument. The upper side of the coil spool or core 44 is spaced below the upper arms A of the magnets 40 and the strings S pass through the space between the coil and the magnets. The winding 45 is of course suitably covered or insulated.

The pick-up 14 further includes core members or pole pieces 46 for attracting or concentrating the lines of magnetic force at or about the strings S so that the vibration of the strings produces maximum current output and maximum variations in the induced current. The pole pieces 46 pass upwardly through spaced vertical openings in the core 44 and are arranged to occupy the same vertical planes as the strings S. There is one pole piece 46 provided for each string S. In accordance with the invention the lower ends of the pole pieces 46 engage or connect with the lower magnet arms B and the pole pieces are formed of magnetic material to form upwardly extending branches or extensions of the lower magnet arms B. As illustrated in the drawings the pole pieces 46 project from the upper side of the core 44 to have their upper ends in spaced opposing relation to their respective strings S. With this relation of parts there are air gaps or spaces occurring between the upper magnet arms A and the pole pieces 46 where the magnetic field or flux is concentrated and the strings S pass through these concentrated field zones to have the maximum effect on the magnetic field and thus produce a maximum induced current in the coil C.

The upper ends of the pole pieces 46 are in an arcuate series, that is, the pole pieces project varying distances from the core 44 to have their upper ends generally equal distances from the springs S. However, the distances from the pole pieces 46 to the strings S vary according to the sizes or diameters of the strings, the distances being greater at the large strings and smaller at the light strings. It is to be observed that the arrangement of magnets 40 above described and the shape of the magnet arms A bring the pole ends of the arms A substantially directly above the pole pieces 46 to assure maximum or main magnetic flux zones through which the strings S pass. I have found it desirable to pitch or slope the upper ends of the innermost pole pieces 46 downwardly and inwardly or toward one another to increase the areas of these pole pieces in the magnetic field and thus compensate for the pitch of the magnets. The screws 42 extend upwardly through openings in the core 44 and may serve to secure the coil C in place.

The coil C has one electrical lead extending from the outer end of the winding 45 and the inner end of the winding 45 is electrically connected with the lower arm B of one of the magnets 40. An electrical lead extends from this magnet. In Fig. 1 of the drawings the numeral 47 designates the electrical leads extending from the pick-up 14. The leads 47 may extend through a suitable flexible tube 48 projecting upwardly from the body 10. The leads 47 extend rearwardly through the hollow body 10 to a jack plug 48[a] in the shoulder part 16. A volume control 49 may be interposed in one of the leads 47 and may have an operating knob 50 readily accessible at the inner end of the body 10.

In accordance with the invention the pick-up 14 is supported on the body 10 for both longitudinal and vertical adjustment relative to the bridge 13 and the other parts. The above mentioned supporting plate 41 is provided with a depending tongue 51. An adjustable sleeve or collar 33[b] similar to or identical with the above described collar 33 surrounds the body 10 and has an upwardly projecting flange 52. Screws 53 or the like secure the depending tongue 51 to the flange 52. The tongue 51 has vertical slots 7 passing the screws 53 and a clamp plate 6 is clamped against the front of the tongue by the heads of the screws 53. When the screws 53 are loosened the pick-up unit 14 may be adjusted vertically. When the screw 36[b] of the collar 33[b] is loosened the collar may be moved along the body to vary the position of the pick-up 14. The screw 36[b] may be tightened to secure or fix the pick-up means 14 in the selected position.

It is believed that the operation of the instru-

ment of this invention will be readily understood from the foregoing detailed description. The instrument may be played in substantially the same manner as a conventional violin, the strings S being bowed and plucked in the usual manner. The instrument is particularly light in weight and is small and compact to be conveniently handled and played. The tailpiece 12, the bridge 13 and the pick-up 14 may be adjusted along the body 10 to provide the instrument with the desired pitch or tuning and, if desired, the body 10 may be extended or contracted. The manners of adjusting the parts and for extending and contracting the body 10 have been described above. The pick-up 14 is constructed so that it does not interfere with the free bowing, plucking, and fingering of the strings S. The magnets 40 have their outer parts in close adjacent relation to the sides of the body 10 and the magnets do not form undesirable obstructions or projections. When the strings S are vibrated as by bowing or plucking the vibration of the strings results in disturbances in the magnetic field which induce a current in the coil C. The strings S pass through the zones of concentrated magnetic flux or magnetic reluctance between the arms A and the upper ends of the pole pieces 46, so that the vibration of the strings S develops or induces a maximum current in the coil C. The induced current is carried by the leads 47 to be amplified and reproduced as sound by the amplifying and reproducing unit (not shown). It will be apparent that the vibratory strings S influencing or disturbing the magnetic flux between the arms A and the pole pieces 46 induce a current in the coil C having the frequencies and other characteristics of the tone producing vibrations of the strings and the amplifying and sound reproducing means receiving this current faithfully reproduces the sound produced by the strings S. The volume of the sound produced or reproduced may be conveniently controlled by the volume control 49 carried by the body 10.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art or fall within the scope of the following claims.

Having described my invention, I claim:

1. An electrical stringed musical instrument comprising an elongate body, tensioned strings stretched across the body, an electrical pick-up sensitive to vibration of the strings, and means supporting the pick-up on the body for adjustment longitudinally of the strings comprising a sleeve engaging around and shiftable along the body.

2. An electrical stringed musical instrument comprising an elongate body, tensioned strings stretched across the body, an electrical pick-up sensitive to vibration of the strings, and means supporting the pick-up on the body for adjustment longitudinally of the strings comprising a split ring carrying the pick-up and engaged about the body for movement lengthwise thereof, and means for tightening the ring on the body to secure the pick-up in the selected position.

3. An electrical stringed musical instrument comprising a cylindrical body, tensioned vibratory strings extending longitudinally of the body, spaced rings engaged around and shiftable along the body, a bridge for the strings carried by one of the rings, a pick-up device carried by another ring and sensitive to vibration of the strings, and means for securing the rings against movement.

4. An electrical stringed musical instrument comprising a cylindrical body, tensioned vibratory strings extending longitudinally of the body, spaced rings engaged around and shiftable along the body, a bridge for the strings carried by one of the rings, a pick-up device carried by another ring and sensitive to vibration of the strings, a tail piece for anchoring the strings carried by another ring, and means for securing the rings against movement.

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