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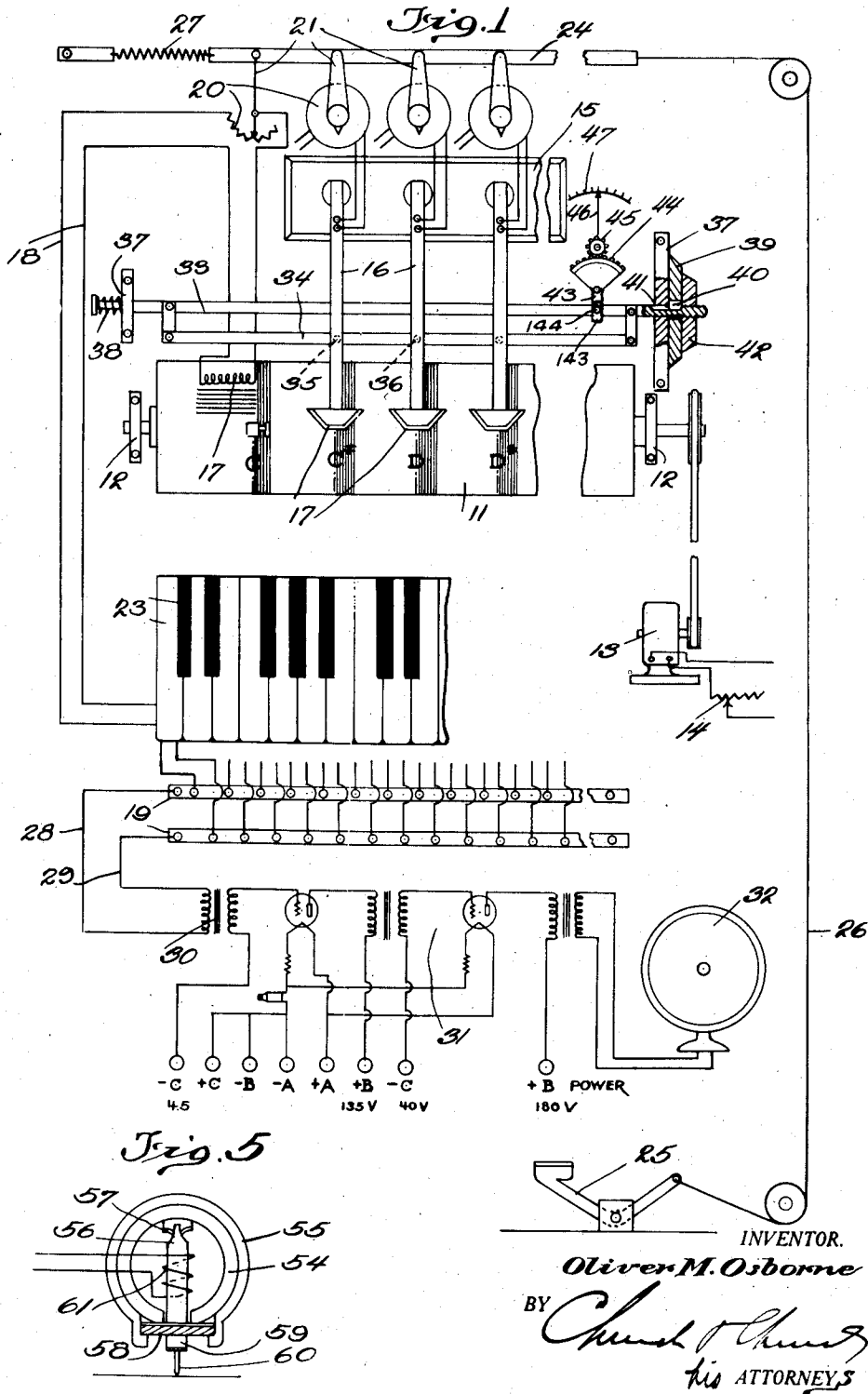
O. M. OSBORNE

1,817,704

MUSICAL INSTRUMENT

Filed July 25, 1928

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Fig. 3

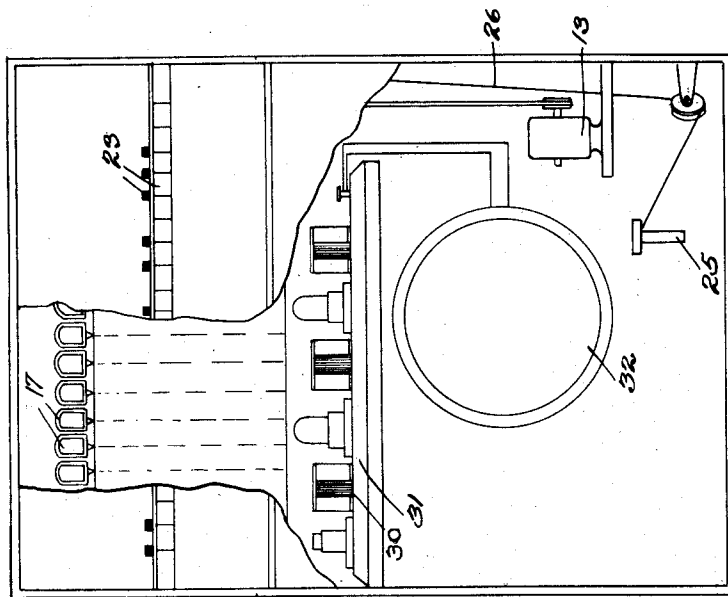
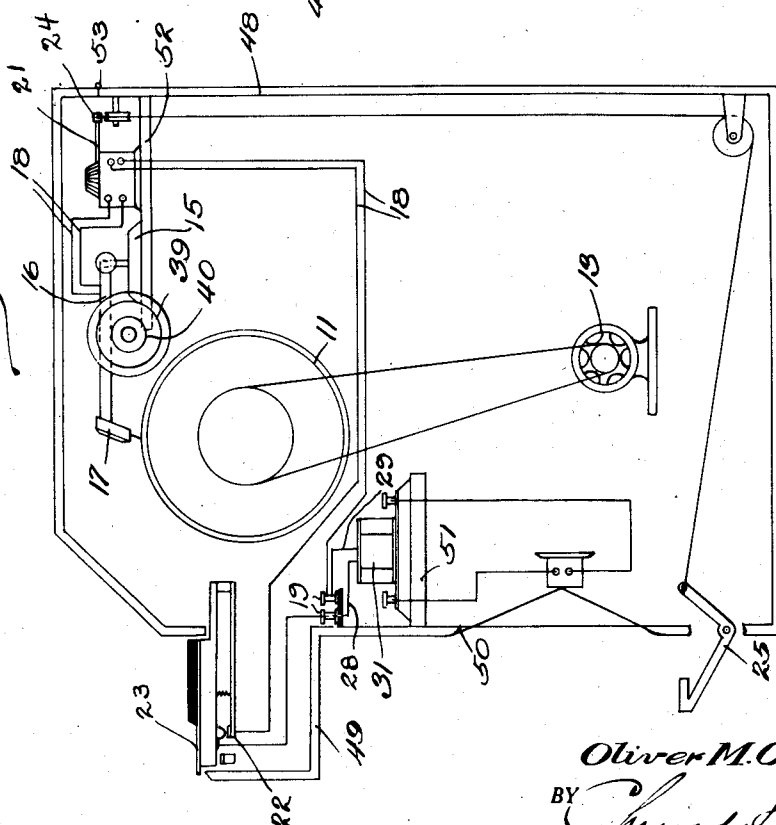


Fig. 2



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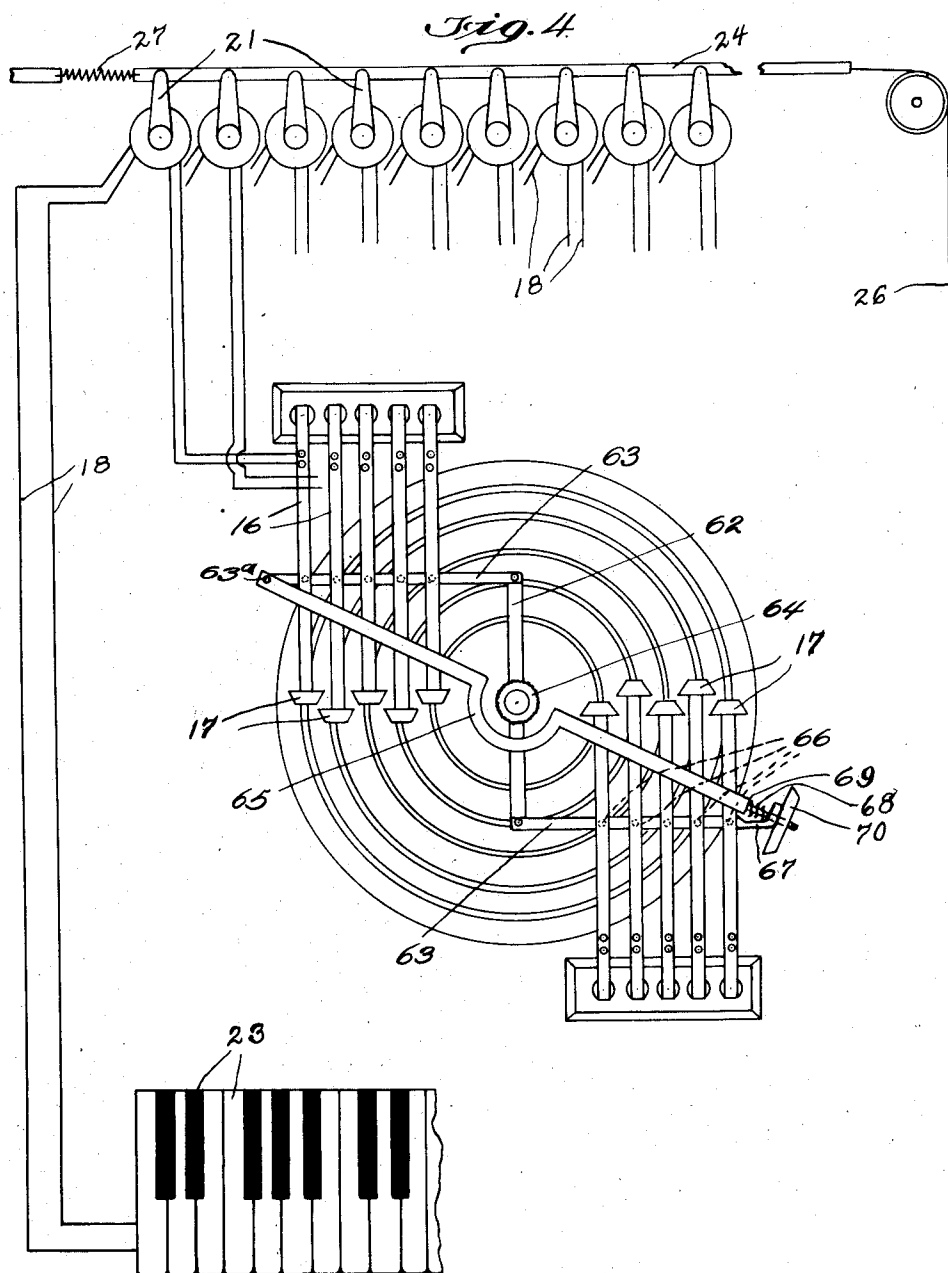
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MUSICAL INSTRUMENT

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4 Sheets-Sheet 3



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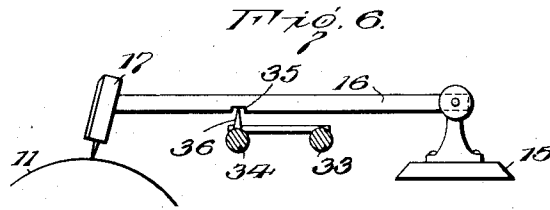
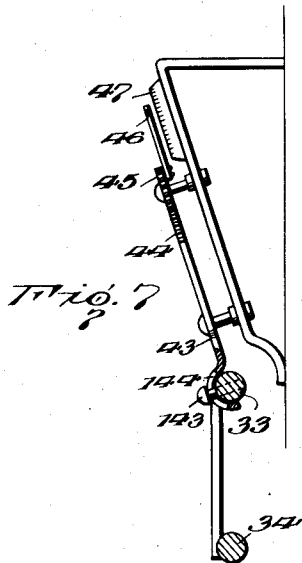
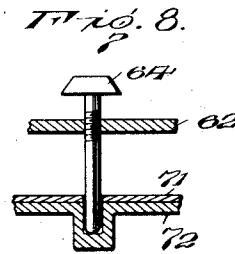
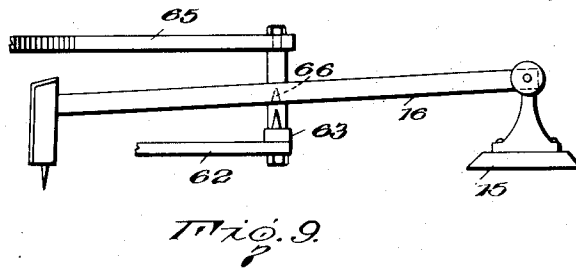
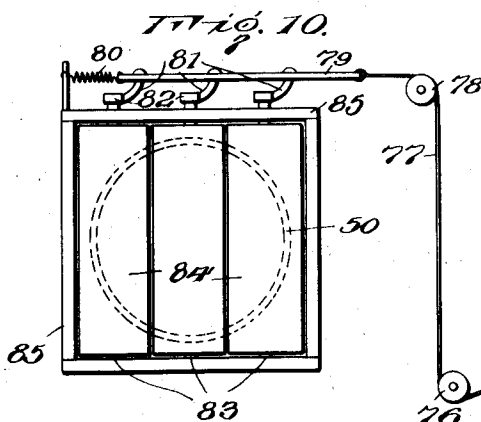
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MUSICAL INSTRUMENT

Filed July 25, 1928

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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MUSICAL INSTRUMENT

Application filed July 25, 1928. Serial No. 295,213.

This invention relates to musical instruments and more particularly to instruments for electrically reproducing the previously recorded tones of any particular instrument desired and in any desired combination of tones.

One of the objects of the invention is to provide means which may be controlled by a comparatively unskilled operator to reproduce the tones of any selected singer or musical instrument in any selected combination of notes. Further objects are to provide for control of such a reproducing means by manually operated keys similar to those of a piano forte so as to be operable by anyone skilled in playing a piano or organ, and to provide controlling means which will be portable to permit the operator to be at a considerable distance from the apparatus. A still further object of the invention is to provide apparatus of this type which may be easily operated and controlled by a light touch and will produce a volume of sound readily adjustable within wide limits. Other objects of the invention, as well as the features of novelty in structure, arrangement of parts, and operation, will be apparent from the following specification when read with the accompanying drawings, in which:

Fig. 1 is a diagrammatic view illustrating an embodiment of the invention;

Fig. 2 is a view in side elevation of a physical embodiment of the invention, one end of the casing being removed to show the arrangement of the parts;

Fig. 3 is a view in front elevation of the structure shown in Fig. 2, a part of the front wall being broken away;

Fig. 4 is a diagrammatic view similar to Fig. 1, but showing a modified form of certain parts as adapted for use with disk records; and,

Fig. 5 is a detail view of one of the electromagnetic "pick up" devices shown in Figs. 1 to 4.

Fig. 6 is a detail elevational view showing a portion of the connections for adjusting the "pick up" devices;

Fig. 7 is a similar view, showing the con-

nections for operating the indicator which indicates the instrument to be reproduced;

Fig. 8 is a detail vertical sectional view of the "pick up" mounting shown in Fig. 4;

Fig. 9 is a detail elevational view of the connections for altering the positions of the "pick up" devices as arranged in Fig. 4;

Figs. 10 and 11 are elevational and top plan views, respectively, of the connections for manipulating the shutters for controlling the volume of the tones reproduced by the present device.

In general, the invention contemplates providing a number of sets of tone records, each record representing a single sustained tone and those of each set representing the various notes of the scale as produced by a selected voice or musical instrument or selected combination of voices or instruments. A series of "pick up" devices are arranged to register with all of the records of any one set and to be shifted as desired to register with all of the records of any other selected set, the type of "pick up" depending upon the type of tone record used. In the disclosed embodiment tone records similar to the general type now used for phonographic reproduction are employed, the "pick up" comprising a stylus engaged in the record grooves actuating the armature of a miniature electric generator in accordance with the vibrations imparted by the groove walls. The electric current from such "pick up" devices is controlled by a set of manually controlled switches, preferably arranged like the keys of a piano forte keyboard, and the currents from the particular switches which are closed at any instant passing to common bus bars and thence to an amplifying device of the audion type and being translated to sound by any suitable "loud speaker".

As shown schematically in Fig. 1, the invention may be applied to use a plurality of series of records made upon a cylindrical member 11, which is somewhat similar to the usual cylindrical phonograph record but differs therefrom in that each groove is a complete closed ring and does not travel axially of the cylinder. The tone records of the

chromatic scale are made in any desired manner upon the cylinder, being arranged in series and spaced from each other as indicated at C, C#, D, D#, etc., all of such records of each scale made by one instrument constituting a series of any desired range. In other words, one group of each series of records is made by a selected instrument until records have been made of all instruments or voices it may be desired to reproduce.

The cylinder 11 is mounted for rotation in bearings 12 and preferably driven by an electric motor 13, having an adjustable resistance 14 for regulating its speed. Where tone records of the type illustrated are used, there is provided a support 15 on which a plurality of arms 16 are pivotally mounted, each carrying at its end an electric "pick up" device or reproducer 17, there being one "pick up" device for each note of the range determined upon. For instance, if it is desired to reproduce notes of a range of five octaves, it would be necessary to utilize sixty-one "pick up" devices. The wires 18 leading from any one "pick up" device are connected to bus bars 19, a resistance 20 controlled by a lever arm 21 and a switch 22, which is normally open but is operable by a key 23, being connected in series with the "pick up" device. A link 24 is connected to all lever arms 21 to operate them in unison, the link itself being operably connected to a pedal 25 by a flexible member 26, or other suitable means, and a spring 27 being connected to the link 24 to resist the action of the pedal.

The bus bars 19 are connected by wires 28 and 29 to a transformer 30 of an amplifying system 31 of the audion type, which is supplied with the usual battery connections as indicated in Fig. 1, and the output of which is connected as shown to a "loud speaker", or other suitable sound reproducer 32. The keys 23, which operate the switches 22, are preferably arranged similarly to those of a piano forte keyboard, so as to be readily operable by anyone trained in the playing of a piano or organ. However, particularly for stage use, it may be preferable to use a keyboard of compact design such as those used on accordions, and it will be understood that the keyboard requires no connection to the rest of the apparatus except the wires 18, 28 and 29, which may be embodied in a cable of suitable length, so that the keyboard will be portable to a limited extent.

In order to provide for shifting the "pick up" devices 17 from the records of the notes made by one particular instrument to the records of the corresponding notes as made by another instrument, a sliding bar 33 is arranged under the arms 16 and is provided with lateral projecting means such as a bar 34, which is rigid with the bars 33 and adapted to be engaged with the arms 16 by

rotation of the bar 33, there being a slight recess 35 in each of the arms 16 into which one of a number of projections 36 on the bar 34 will engage to swing the arms about their pivots as the bars 33 and 34 move lengthwise. The bar 33 is mounted in suitable bearings 37 and is provided with a spring 38 at one end, tending to move it in one direction. The other end of the bar 33 is threaded and provided with a rotating knob 39, which has a key 40, received in a key-way 41 in the bar, by which the bar may be rotated, and the bar 33 is also provided with an operating knob 42, threaded thereon, by rotation of which the bar may be moved longitudinally. A suitable indicating means is provided to be actuated by the lengthwise movement of the bar 33, being shown in Fig. 1 as consisting of a lever 43 having one end connected to the bar 33 and its other end formed with an arcuate rack 44 in mesh with a gear wheel 45, which carries an indicating needle 46 along an arcuate scale 47, which may be inscribed with indicia representing the various instruments. Bar 33 and lever 43 are connected to each other by a pin 143 working in a slot 144 in said lever and the end of the lever is preferably curved to permit rocking of said bar.

As shown in Figs. 2 and 3, the apparatus may be conveniently arranged in a casing 48, with a projecting front portion 49 below the keys 23, and having an opening 50 in which the loud speaker 32 is emplaced. The amplifying unit 31 may be conveniently supported upon a shelf 51 which projects inwardly from the front wall, and the means for supporting and adjusting the "pick up" devices, as well as the resistances for controlling the sound volume, may be carried upon a second shelf 52, which projects forwardly from the rear wall. The top of the casing is hinged at 53 to the body of the casing to permit access for adjustment and repair of the parts, and if desired the operating knobs 39 and 40 may be placed on the outside of the casing for more convenient access, and a sight opening may be provided to render the indicating means 47 visible without lifting the cover.

The "pick up" devices 17, as shown in detail in Fig. 5, consist essentially of a horseshoe magnet 54 mounted in a compact metallic casing 55, and a vibrating magnetic reed 56, held at one end by a very flexible spring 57 and extending between the pole pieces of the magnet 54, and damped by a rubber damper 58. The end of the reed 56 is provided with a socket 59 in which a needle 60 may be detachably secured, and a coil 61 of fine insulated wire surrounds the reed so that varying current is induced in the coil by the movement of the needle and reed 56. It will be understood that the "pick up" devices may be so mounted as to have a minimum of pressure against the record, and that similar de-

vices such as the capacity coupled "pick up" devices may be utilized instead of the electromagnetic device shown.

In Fig. 4, the various parts shown are identical with those shown in Fig. 1, except that the mounting for and means for adjusting the arms 16 are altered to permit the use of flat disk records. A bar 62, having arms 63 pivoted thereto and passing under the arms 16, is mounted upon a threaded vertical post which extends upward through the center of the record 71, but does not rotate with it. A knob 64 is fixed upon the vertical post and has a swivel connection with the bar 62, so that by rotation of the knob 64, members 62 and 63 may be raised to contact with and raise all of the arms 16, the bars 63 being provided with small projections or teeth which enter slight conical recesses 66 in the underside of the arms 16. A second bar 65 extends at an angle to bars 63 above the arms 16 and has a threaded end which is slidably mounted in a lug 67 at the end of one of the arms 63, the other end of bar 65 being pivoted to and spaced vertically from the end of the other member 63 at 63^a. A spring 68 surrounds the bar 65 between a projection 69 thereon and the lug 67 to move the bar 65 in one direction, and an operating knob 70 is threaded upon the bar 65 and engages the lug 67, so that it may be rotated to move the bar 65 and hence all of the arms 16 and "pick up" devices simultaneously.

As is shown in the two embodiments illustrated, it is preferred that the "pick up" devices be adjustable relatively to the tone records, although it is possible, of course, that this relative movement for changing the instrument to be reproduced may be accomplished in other ways.

From the foregoing, it will be seen that by properly adjusting the relative positions of the "pick up" devices and the records, the tones of any one desired instrument may be reproduced by actuation of the keys of the keyboard. In this connection it is to be understood that while the tones of any one instrument are being reproduced, the so-called "pick up" devices are operatively associated with the tone records and retain this operative relationship with the records until the parts are again adjusted to reproduce the tones of a different instrument. Such operative association is, however, not to be construed as involving actual contact of "pick up" with record, since other methods of sound reproduction are well known which employ "records" and "pick up" devices which are operatively associated without actual wearing contact.

This invention consists broadly of a plurality of series of tone records, each series representing the tones of a distinct instrument or group of instruments, a plurality of devices operatively associated with the

tone records for "picking up" the recorded tones of one series and impressing a faithful translation of each tone of the series upon one of a plurality of electric circuits, a plurality of switches arranged in keyboard order, each switch controlling the continuity of one circuit, and an electrical sound producing apparatus controlled by the circuits for faithfully translating into sound the electrical undulations set up in the circuits the switches of which are closed. While several embodiments of the invention have been illustrated employing records and "pick up" devices of the groove and stylus type, it is to be understood that such forms are for the purpose of illustration only, and I contemplate the use of other methods of reproduction now well known in this art. I, therefore, claim my invention broadly as indicated by the appended claims.

What I claim is:—

1. A device for reproducing tones of any one of a plurality of instruments comprising a plurality of series of tone records the records of each series being produced by different instruments, a plurality of electrical pick-up devices, means for effecting relative movement between said records and said pick-up devices; electrically operated translating means, a keyboard, and a switch carried by each key of said keyboard, each switch controlling the connection of one pick-up device to the translating means said "pick-up" devices being constantly actively associated with said tone records during the reproduction of the tones of any one instrument.

2. A device for reproducing tones of any one of a plurality of instruments comprising records of the tones of a plurality of instruments grouped in coincident scales, a plurality of electrical pick-up devices, means for effecting relative movement between said records and said pick-up devices, electrically operated translating means, means for selectively controlling the connection between said pick-up devices and said translating means, and means for effecting relative movement between said records and said pick-up devices to bring said pick-up devices from registry with the records of one instrument into registry with the records of another instrument said "pick-up" devices being constantly operatively associated with said tone records except when moved by said last mentioned means.

3. A device for reproducing tones of any desired one of a plurality of instruments comprising means bearing records of the tones of a plurality of instruments grouped in coincident scales, a plurality of electrical pick-up devices spaced to register with and constantly operatively associated with the records of the various tones of a selected instrument, means for rotating said record

bearing means, means for shifting said pick-up devices from registry with the records of one instrument to registry with the records of another instrument, electrically operated translating means, and means for selectively controlling the connection between said pick-up devices and said translating means.

4. A device for reproducing tones of any desired one of a plurality of instruments comprising records of the tones of a plurality of instruments grouped in coincident scales, a plurality of electrical pick-up devices constantly operatively associated with the tone records, means for effecting relative movement between said records and said pick-up devices to produce current variations in said pick-up devices, power amplifying means, translating means in the output circuit of said power amplifying means, a keyboard, and a switch operable by each key of said keyboard and controlling the connection of the corresponding pick-up device with said power amplifying means.

5. A device for reproducing tones of any desired one of a plurality of instruments comprising records of the tones of a plurality of instruments grouped in coincident scales, a plurality of electrical pick-up devices constantly operatively associated with the records of said tones, means for effecting relative movement between said records and said pick-up devices to produce current variations in said pick-up devices, power amplifying means, translating means in the output circuit of said power amplifying means, a keyboard, a plurality of switches each controlling the connection of one of said pick-up devices with said power amplifying means and operable by one of the keys of said keyboard, and means for relatively shifting said records and said pick-up devices to bring the pick-up devices into registry with the records of another instrument.

6. A device for reproducing tones of any desired one of a plurality of instruments comprising records of the tones of a plurality of instruments grouped in coincident scales, a plurality of pick-up devices constantly operatively associated with said tone records, means for effecting relative movement between said records and said pick-up devices, a common sound reproducer for all of said pick-up devices, means for selectively controlling the connection of said pick-up devices to said reproducer, and means for effecting relative movement between said records and said pick-up devices from registry with the records of one instrument into registry with the records of another instrument.

7. A device for reproducing tones of any desired one of a plurality of instruments comprising records of the tones of a plurality of instruments grouped in coincident scales, a plurality of pick-up devices constantly operatively associated with said tone records,

means for moving said records past said pick-up devices, means for moving said pick-up devices from registry with the records of one instrument into registry with the records of another instrument, and indicating means operable by said means for moving the pick-up devices.

8. A device for reproducing tones of any desired one of a plurality of instruments comprising tone records, a plurality of electrical pick-up devices constantly operatively associated with said tone records, means for effecting relative movement between said records and said pick-up devices to produce current variations in said pick-up devices, electrically operated translating means, means for selectively controlling the connection of said pick-up devices to said translating means, and manually operated means for varying the amplitude of the current variations.

9. A device for reproducing tones of any desired one of a plurality of instruments comprising tone records, a plurality of electrical pick-up devices constantly operatively associated with said tone records, means for effecting relative movement between said records and said pick-up devices to produce current variations in said pick-up devices, electrically operated translating means, means for selectively controlling the connection of said pick-up devices to said translating means, a resistance in circuit with each pick-up device to vary the amplitude of the current variations therein, and common means for regulating all of said resistances.

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