

Nov. 7, 1939.

V. H. SEVERY

2,178,706

MUSICAL INSTRUMENT

Filed April 21, 1936

3 Sheets-Sheet 1

FIG. 1.

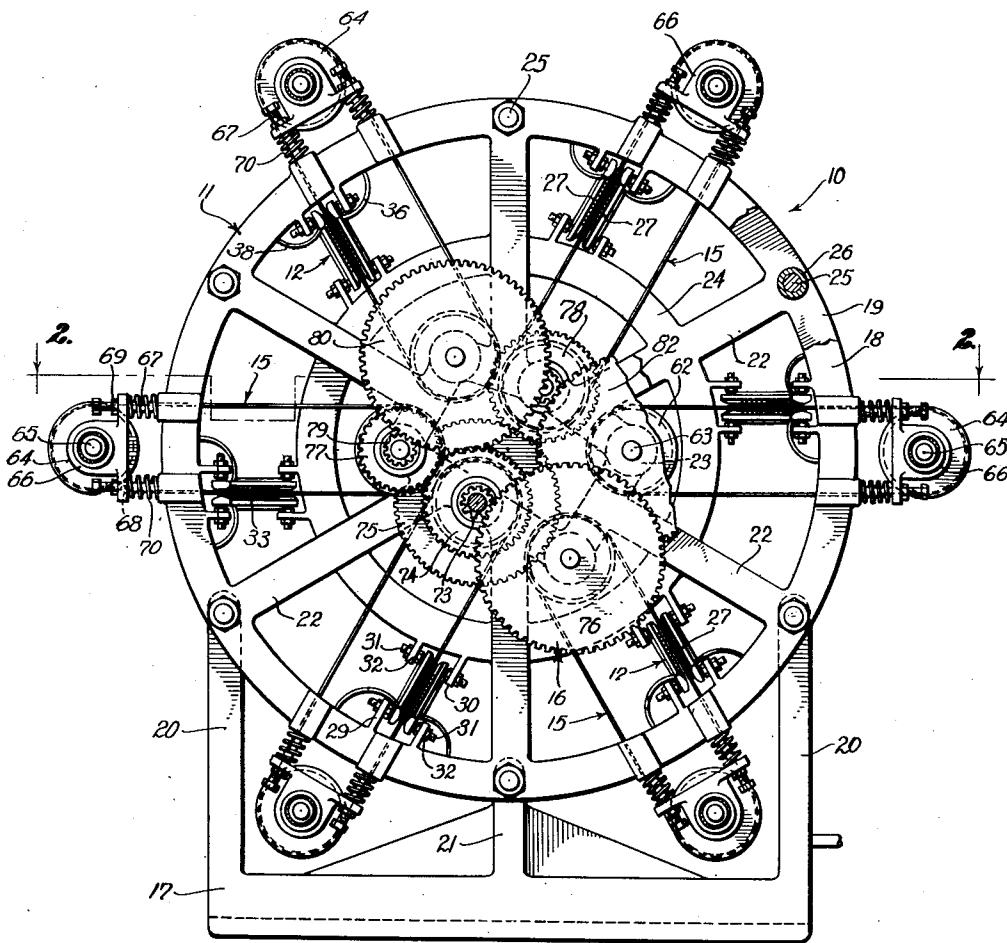


Fig. 9.

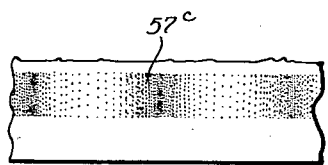
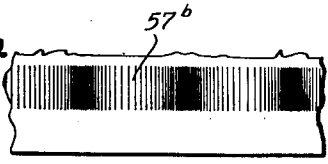


Fig. 10.



Inventor
VICTOR H. SEVERY
By
V. H. Severy
His Attorney

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V. H. SEVERY

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3 Sheets—Sheet 2

Fig. 2.

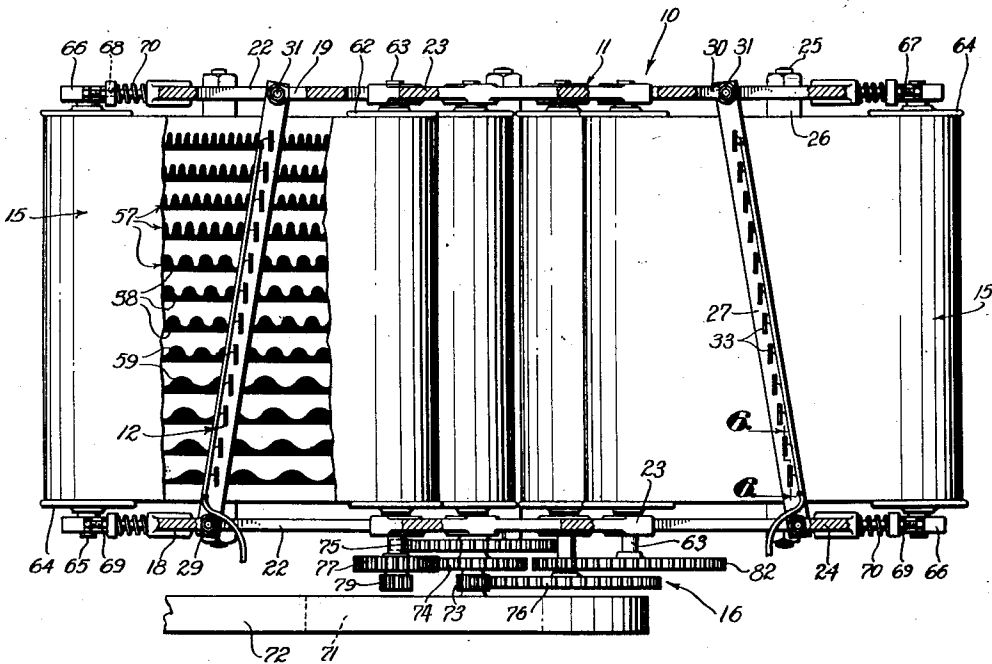


Fig. 3.

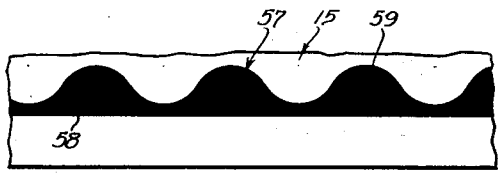


Fig. 4.

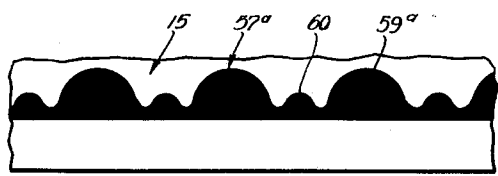
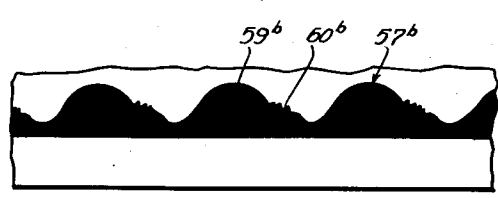


Fig. 5.



Inventor
VICTOR H. SEVERY
By
[Signature]
Attorney

UNITED STATES PATENT OFFICE

2,178,706

MUSICAL INSTRUMENT

Victor H. Severy, Glendale, Calif.

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4 Claims. (Cl. 84—1.14)

This invention relates to musical instruments and relates more particularly to electrical musical instruments. A general object of this invention is to provide a practical electrical musical instrument embodying electrostatic pick-up means and novel sound strips or records cooperating with the pick-up means.

a sound strip or sound record of the character mentioned in which the sound tracks or bands may be produced photographically to truly represent the tones produced by an instrument such as a fine organ whereby the tracks or bands may influence the electrostatic pick-ups of an instrument of the character mentioned above to effect the accurate and faithful reproduction of said tones.

Another object of this invention is to provide an electrical musical instrument capable of faithfully producing pure, true, fundamental tones, fundamental tones with one or more harmonics of the same and the tones of a selected instrument such as an organ or the like, all at the will and option of the manufacturer and musician.

Another object of this invention is to provide a phonetic strip or sound record of the character mentioned in which the sound tracks or bands may be printed, drawn, or otherwise provided on the record to have the shapes or curves of selected, pure, fundamental tones, selected fundamental tones with one or more harmonics or a compound tone as produced by an organ or the like.

Another object of this invention is to provide a musical instrument of the character mentioned that may embody as many electrostatic pick-ups and sound records therefor as desired, to be capable of producing any desired number of musical tones.

Another object of this invention is to provide an electrical musical instrument of the character mentioned embodying a plurality of series of relatively stationary electrostatic pick-ups and a plurality of sound strips or sound records continuously moving at constant speeds between or past the field pieces of the pick-ups and each bearing a series of spaced sound markings or bands of different tone shapes capable of varying the potentials of the fields of their respective pick-ups and controls for the said pick-ups adapted to be selectively operated or manipulated by the musician.

Another object of this invention is to provide a simple, compact electrical musical instrument embodying one or more units each comprising a multiplicity of electrostatic pickups influenced by or responsive to metallic or partially metallic tracks or bands on moving belts or records, the records of different units producing sounds of different tonal characters as desired.

The other 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 drawings, in which:

Another object of this invention is to provide a simple, novel and particularly effective sound strip or sound record bearing a multiplicity of sound markings or bands of metallic or partially metallic material, each having the curve or characteristic shape of a reproduced tone.

Fig. 1 is a side elevation of one of the units provided by this invention with a portion broken away to illustrate the remote parts. Fig. 2 is a transverse detailed sectional view taken substantially as indicated by line 2—2 on Fig. 1 with a portion of one of the sound records broken away to illustrate the sound bands thereon. Figs. 3, 4 and 5 are enlarged fragmentary plan views of portions of sound records illustrating various forms of sound bands. Fig. 6 is an enlarged fragmentary detailed sectional view taken substantially as indicated by line 6—6 on Fig. 2. Fig. 7 is an enlarged transverse detailed sectional view taken as indicated by line 7—7 on Fig. 6. Fig. 8 is a wiring diagram illustrating the circuits and related parts embodied in the invention, and Figs. 9 and 10 are fragmentary eleva-

Another object of this invention is to provide a simple, novel and particularly effective sound strip or sound record bearing a multiplicity of sound markings or bands of metallic or partially metallic material, each having the curve or characteristic shape of a reproduced tone.

Another object of this invention is to provide a sound strip or sound record for use with electrostatic pick-up units and comprising a continuous flexible web or belt bearing a plurality of continuous bands of metallic or partially metallic material printed, drawn or otherwise provided thereon, each band operating by reason of its area, density, outline or configuration and the character of its material to vary the potential of the field of its respective electrostatic pick-up and thus produce modulations or fluctuations in an electrical circuit which may be imposed on a suitable sound producing circuit or speaker unit.

Another object of this invention is to provide

tion views of sound records bearing variable density sound tracks or bands.

The instrument provided by the present invention includes, generally, one or more units 10, each comprising a suitable frame 11, a multiplicity of series of electrostatic pick-ups 12 carried by the frame 11 and operable to influence a suitable loud speaker unit or circuit 13, controls 14 for the electrostatic pick-up 12, a plurality of sound strips or sound records 15 each adapted to cooperate with or influence a series of the pick-ups 12, and means 16 for moving the records 15. The instrument of the present invention may comprise one or more of the units 10, as desired or necessary. As the units 10 may be alike or identical, I will proceed with a detailed description of one typical unit 10, it being understood that the invention is not to be construed as limited or restricted to the employment of one such unit.

The frame 11 of the unit 10 is provided to carry the pick-ups 12, the records 15 and the means 16 for moving the records. In accordance with the broader aspects of the invention the body or frame 11 may be varied considerably in shape, construction, etc. In the particular case illustrated, the frame 10 comprises a base 17 and two end members 18 and 19 supported on the base. The base 17 may be arranged on any suitable support and has spaced legs 20 and bosses 21 projecting from its upper side to carry the members 18 and 19. The end members 18 and 19 of the frame 11 may be circular or disc-shaped in their general configuration. The members 18 and 19 may be vertically disposed on the base 17 in substantially parallel relation with one another and are preferably in the form of skeleton frame parts to be light in weight. In the particular structure illustrated in the drawings the end frame members 18 and 19 have spaced radial arms 22 extending inwardly from their peripheral parts and terminating at their inner ends in webs 23. The end member 19 has a ring or annular part 24 extending between and connecting its several arms 22 at points between the webs 23 and its peripheral part. Bolts or tie rods 25 extend between and connect the peripheral parts of the members 18 and 19 at the outer ends of the arms 22. Certain of the tie rods 25 may be employed to secure the frame members 18 and 19 to the base legs 20 and the bosses 21. Suitable spacers 26 may be provided on the rods 25 to maintain the end members 18 and 19 in their proper spaced relation.

The electrostatic pick-ups 12 are provided on the frame 11 to have the sound records 15 pass between their field members or field pieces. The electrostatic pick-ups 12 are preferably arranged in spaced series, each of said series being responsive to or under the influence of a single record 15. Two supports 27 are provided for each series of pick-ups 12. The supports 27 may be alike in size and shape and are preferably formed of a suitable insulating material. The supports 27 extend between and are carried by the frame members 18 and 19. In practice, the supports 27 may be in the nature of bars of suitable cross sectional shape. In the preferred construction, the supports 27 are substantially rectangular in transverse cross section and each has a rounded or convex surface 28. The two supports 27 of each series of pick-ups 12 are arranged in spaced substantially parallel relation with their faces 28 opposing one another. The opposite ends of the supports 27 are carried by the members 18

and 19. Pairs of spaced lugs 29 are provided on the peripheral portion of the member 18 at circumferentially spaced points and pairs of similar lugs 30 are provided on the annular part 24 of the member 19. It is preferred to space the series of pick-ups 12 circumferentially in the frame 11 and the pairs of lugs 29 and 30 are arranged in sets of one pair of lugs 29 and one pair of lugs 30. These sets of lugs 29 and 30 are preferably in planes or zones tangential with respect to a circle concentric with the horizontal axis of the frame 11. Bolts or studs 31 are secured to the supports 27 adjacent their ends and pass through openings in the lugs 29 and 30. Adjusting nuts 32 are threaded on the studs 31 to clamp against the opposite sides of the lugs 29 and 30 to hold the supports 27 in adjusted or set positions. As best illustrated in Fig. 2 the supports 27 mounted as just described are inclined or pitched with respect to the central horizontal axis of the frame 11. The reason for thus pitching the supports 27 will be hereinafter described.

The electrostatic pick-ups 12 each include two field pieces or field members 33. As above described the pick-ups 12 are arranged in sets or series, said series being carried by the several pairs of spaced supports 27. The field members 33 of the pick-ups 12 are spaced along the supports 27, the members 33 on one support 27 being directly opposite the corresponding or respective members 33 on the adjacent support 27. It is to be understood that each pair of adjacent opposing field members 33 constitutes a pick-up 12. The field members 33 are in the nature of blocks of suitable electrical conducting material suitably connected to or secured to the supports 27 of insulation. In practice it may be found desirable to embed the field members 33 in the insulating supports 27 when the supports are formed or cast. The field members 33 project from the opposing surfaces 28 of the members 27. The field members 33 may also project from the outer or rear surfaces 27^a as illustrated in the drawings. The members 33 are preferably rectangular and are arranged with their greatest dimensions or axes substantially parallel with the horizontal axis of the frame 11.

The adjacent field members 33 on the insulating supports 27 are spaced apart to prevent the interference of their fields. The pitching of the supports 27 with respect to the axis of the frame 11 as above described, provides for a sufficient spacing of the field members 33 on supports 27 of minimum length. The inner opposing ends of the field members 33 taper or converge to relatively narrow edges or faces 35 to provide concentrated field areas or zones in the several pick-ups 12. The opposing faces 35 are spaced apart to leave or provide suitable field spaces and to permit the movement or passage of the phonetic records between them with suitable clearance. The number of pick-ups 12 provided on each pair of insulating supports 27 depends upon the number of sound tracks or sound bands provided on the records 15. In the instrument or unit 10 illustrated, there are six series of pick-ups 12, each series involving twelve pick-ups 12 so that the unit 10 involves a total of seventy-two pick-ups.

The pair of field members 33 comprising each pick-up 12 is connected in a suitable direct current circuit. In the particular arrangement illustrated in Fig. 8, a conductor 36 is electrically connected with one member 33 of each pick-up 12 and extends to a pre-amplifier 37. There is

a pre-amplifier 37 provided for each pick-up 12. A common power line or conductor 38 is electrically connected with the other members 33 of the pick-ups 12 and connects them with the other incoming terminals of the pre-amplifiers 37. Lines or conductors 39 connect one outgoing terminal of each pre-amplifier 37 with a suitable unit transformer 40. The control means or controls 14 are interposed in and govern the conductors 41 extending from the other outgoing terminals of the pre-amplifiers 37.

The transformer 40 is connected with the suitable speaker unit 13 through conductors 42 whereby regular successive variations in the fields of the pick-ups 12 produce pulsations or fluctuations in the circuits of the units which are imposed on the speaker unit 13 to be converted into audible sounds or musical tones. A suitable volume control 43 is provided for the speaker unit 13. The volume control 43 is preferably governed by a pedal 44. The pedal 44 is preferably located adjacent or below the keys of the controls 14. It is to be understood that the unit 10, or units 10, may be at a point remote from the pedal 44 and the keys of the controls 14 as well as the speaker unit 13, or if desired, the entire apparatus may be housed in a single common case.

The controls 14 for the pick-ups 12 are preferably manual controls of such character that a musician, for example, an organist, pianist or the like, may play the instrument, it being understood that the manually engageable instrumentalities of the controls 14 may be of any desired character. In the form of the invention illustrated, the controls 14 each include a depressible key 45. The keys 45 may be similar, generally, to the keys of a piano or organ. Each key 45 carries a contact 46 for cooperating with a relatively stationary contact 47. Conductors 48 extend from the stationary contacts 47 to a common energized line or power line 49.

A relay R is controlled by each manually depressible key 45 to govern the circuit of its respective pick-up 12. The relays R each include a solenoid coil 50 and a shiftable contactor 51 movable by the coil. Conductors 52 electrically connect the contacts 46 of the keys 45 with a terminal of their associated or related coils 50. Lines or conductors 53 connect the other terminals of the coils 50 with a common power line 49. Each relay R embodies a pair of contacts 54 and 55. The lines 41 extending from the pre-amplifiers 37 connect the pre-amplifiers with the contacts 54 of their related relays R. A common conductor 56 may electrically connect the other contacts 55 of the relays R with the transformer 40. Upon depression of a key 45 the relay R governed by that key is energized to effect the energization of its respective pick-up 12 whereby variation or fluctuation of the field of the said pick-up 12, by a phonetic band or sound track, is imposed on the speaker unit 13 to be converted into audible sound.

The sound strips or sound records 15 are important elements or features of the invention. A record 15 is provided to control or cooperate with each series of pick-ups 12. In accordance with the invention the strips or records 15 are in the nature of flexible webs, bands or belts. The records 15 are preferably continuous or endless belt-like elements formed of flat regular material. The records 15 may be formed of paper, fabric, Cellophane or any other suitable non-magnetic and electrically non-conductive flexible sheet material. In the particular unit 10 illus-

trated, the sound records 15 are of the same width and of substantially the same length, it being understood that the records 15 may be of different lengths and widths depending upon the character of the pick-ups 12 and the operating means 16.

Sound markings, or phonetic sound tracks or bands 57 are provided on the records 15 to form the movable armatures of the electrostatic pick-ups 12. In the particular case illustrated the sound tracks or bands 57 are provided on the inner surfaces of the belt-like records 15, it being understood that the bands 57 may be provided on either surfaces or both surfaces of the records as desired. The invention contemplates that the sound bands 57 be printed, drawn, painted or provided on the records 15 photographically or in any other practical manner. The sound tracks or sound bands 57 are preferably of a metallic non-magnetic material or ink or of an ink containing a suitable non-magnetic metal in a finely divided or colloidal state. The bands 57 may be of a metallic ink such as an ink containing aluminum in a finely divided state or may be in the nature of silver printed or deposited on the records 15 by photographic means, as will be subsequently described. As above mentioned the sound tracks or sound bands 57 are provided to vary the potential of the field spaces in the pick-ups 12 and are shaped to effect regular variations or fluctuations in the fields and thus produce frequencies in the circuits of the units 12 of such frequencies that they may be reproduced as musical tones by the speaker unit 13. A plurality of bands 57 is provided on each strip or record 15, there being a band 57 for each pick-up 12. The tracks or sound bands 57 are continuous and extend longitudinally of the records 15 to be parallel with the direction of movement of the records.

The shape of the metallic or partially metallic sound bands 57 is, of course, of great importance. The bands 57 by reason of their shapes, vary the linked potentials between the field members 33 to provide regular variations of the voltages of the circuits of the pick-ups 12 and the pre-amplifiers 37 to be translated into audible sound by the speaker unit 13. The sound tracks or bands 57 may be shaped or of such character as to effect the production of pure true fundamental tones, fundamental tones with one or more harmonics, or compound tones, such as the recorded tones of selected musical instruments. Figs. 2, 3, 4 and 5, illustrate records 15 bearing sound tracks or bands of the variable area type while Figs. 9 and 10 illustrate records having sound tracks of the variable density type. It is to be understood that the instrument may embody or employ either the variable area or the variable density type of sound record in producing the various tones mentioned.

Figs. 2 and 3 of the drawings illustrate variable area tracks or sound bands 57 shaped or formed to produce true pure fundamental tones. These bands 57 may have straight base edges 58. The other edges of the bands 57 are undulated or waved, having multiplicities of waves 59 terminating in crests and troughs. These waves 59 are of curved outline being defined by the proper sine curves. The waves 59 of a sound band 57 are identical and of equal spacing. It will be understood that the size and spacing of the waves 59 of a band 57 and the speed of movement of the record 15 determine the extent and frequency of the fluctuations of voltage in the

electrostatic pick-up 12 and, therefore, determine the musical tone produced by the loud speaker unit 13. Accordingly, where a record 15 is moved at a constant rate the plurality of bands 57 thereon may have different numbers of waves of different areas and curves to produce a number of different tones. In the particular instance illustrated in Fig. 2 of the drawings the record 15, broken away to illustrate its bands 57, bears three groups of four bands 57 each, the group of lower frequencies comprising four bands having a progressively larger number of waves 59 beginning at the band of lowest frequency, the intermediate group of bands 57 comprising four bands whose number of waves 59 are of the first power or multiple of the lower group of bands, and the higher frequency group comprising four bands 57 whose numbers of waves are of the second power or multiple of the lowest frequency series. Thus the record 15, just described, carries bands 57 for the production of four tones in three different octaves, making a total of twelve tones. The several records 15 embodied in the unit 10 may be provided with tracks or bands 57 as just described and may be rotated at six different speeds to produce a chromatic scale of seventy-two tones. It is to be understood that the bands 57 of the records 15 may be related or arranged in manners other than that just described.

In providing the pure fundamental tone bands 57 and the bands 57^a illustrated in Fig. 4, it is probably most practical to print the bands on the records 15. Preparatory to the printing operation a series of bands 57 or 57^a may be laid out and carefully drawn in by employing the proper sine curves. The other bands 57 or 57^a of the record may be drawn in in a similar manner or may be drawn from the first series of bands by means of pantograph. The bands thus drawn out may be drawn on a flat sheet of paper or the like in a manner to permit the forming of the endless belt-like record 15 without any interruption of the proper shape or sequence of the bands 57 or 57^a at the line of connection of the belt record.

The portion of the sound band 57^a illustrated in Fig. 4 of the drawings is characterized by the large waves 59^a for the production of the fundamental tone and the smaller waves 60, in the troughs of the large waves 59^a, for producing the harmonic of the fundamental. The sound band 57^a may be produced in the same manner as the bands 57, it being understood that the bands in each instance are of metallic or partially metallic non-magnetic ink or material. Where the fundamental and harmonic bands 57^a are employed they may be arranged on the records 15 in the same manner as the pure tone bands 57.

Fig. 5 of the drawings illustrates a recorded sound track or sound band 57^b in the nature of a compound band which may be truly representative of a tone produced by a selected musical instrument. This band 57^b is, of course, characterized by the wave form of the recorded tone. The sound band 57^b illustrated has the principal waves 59^b and more or less jagged or irregular waves 60^b merging with the main waves 59^b. The tones of the selected musical instrument may be photographically recorded in any of the well known methods and printed on the record photographically. The silver in the track or band 57^b thus photographically printed is sufficient to form a proper effective movable armature for the electrostatic pick-up 12. Where the sound bands 57^b

are produced photographically the several bands of the plurality of the records 15 may be produced or printed individually. A unit 10 of the instrument may have a multiplicity of records 15 bearing true tone bands 57, a unit 10 may have records 15 bearing bands 57^a of true tones with their harmonics and a third unit 10 may have records 15 bearing photographically produced compound bands 57^b. In some instances it may be preferred to provide a unit 10 with records 15 bearing all three of the different types of sound bands 57, 57^a and 57^b.

The means 16 for moving the records 15 may be varied considerably without departing from the broader aspects of the invention. The means 16 is preferably a power driven means for continuously moving the records 15 at different speeds. In the particular form of the invention illustrated the means 16 is in the nature of a gear and pulley means. Drums or pulleys carry the records 15. Inner drums 62 are provided within the frame 11 and have trunnions or shafts 63 suitably rotatably carried by the webs 23. Outer drums or pulleys 64 are provided at the periphery of the frame 11 in proper substantially radial alignment with the inner pulleys 62. The outer pulleys 64 are supported in a manner to maintain proper tension on the records 15 to prevent slap and looseness in the records. The trunnions or shafts 65 of the outer pulleys 64 are rotatably carried in suitable bearings 66. Stud or rods 67 project from the peripheries of the frame members 18 and 19 and pass through openings 68 in the bearings 66. Adjusting nuts 69 may be threaded on the rods 67 to limit the outward movement of the bearings 66. Springs 70 surround the rods 67 and are under compression to bear outwardly on the bearing 66. The springs 70 maintain proper tension on the records 15 and their action may be adjusted by means of the nuts 69. The pulleys 62 and 64 are positioned so that the sound records 15 pass or move between the field members 33 of the pick-ups 12.

Figs. 9 and 10 illustrate portions of sound records 15 provided with sound tracks of the variable density type. The track 57^c shown in Fig. 9 is composed of spaced dots of metallic or partially metallic material while the track 57^d shown in Fig. 10 is composed of spaced lines of metallic or partially metallic material. It is to be understood that sound tracks such as shown in Figs. 9 and 10 may be employed on the several records 15, if desired.

The means for driving the pulleys 62 and 64 may include a pulley 71 on the trunnion or shaft 63 of one of the inner pulleys 62. The pulley 71 may be driven by a power belt 72. The shaft 63 carrying the pulley 71 also carries three drive gears 73, 74 and 75 of graduated diameter suitably keyed or fixed to the shaft. The smallest gear 73 directly drives a gear 76 fixed on the shaft 63 of a second inner pulley 62. The intermediate gear 74 meshes with a gear 77 fixed on the shaft 63 of a third inner pulley 62. The largest drive gear 75 meshes with a gear 78 fixed on the shaft 63 of the fourth pulley 62. A pinion 79 is fixed on the shaft 63 carrying the gear 77 and drives a gear 80 on the shaft 63 of the fifth pulley 62. A pinion 81 is fixed on the shaft 63 which carries the gear 78 and drives a gear 82 on the shaft 63 of the sixth inner pulley 62. Thus the six inner pulleys 62 are driven by the belt and pulley drive 71-72. The driven pulleys 62 of course move or drive the sound records 15. The gearing of the means 16 is such that the records 15 are driven 71

at six different and properly related speeds. The means driving or moving the belt-like records 15 is positive and continuous.

When the instrument is in use or operation the belt 72 is driven by a suitable power means, preferably a synchronous motor, to provide for the continuous related movement of the six sound strips or records 15 by the means 16, just described. The keys 15 are normally in the positions where the contacts 46 and 47 are out of engagement so that the movement of the armature sound bands 57, 57^a, 57^b, 57^c or 57^d between the field members 33 does not influence or affect the speaker unit 13. When the player or musician depresses a key 45 the relay R associated with that key is energized. Energization of the relay R effects the energization of its respective pick-up 12 providing a circuit through the pick-up. As the records 15 are continuously moving energization of a pick-up 12 is accompanied by the regular variation or fluctuation of the potential in its field. The track or sound band 57, 57^a, 57^b, 57^c or 57^d moving through the field of the pick-up 12 at a constant speed acts to vary or fluctuate the potential in the circuit of the pick-up. These modulations or fluctuations are imposed on the speaker unit 13 through the medium of the pre-amplifier 37, and transformer 40, and are converted into an audible musical tone by the speaker unit 13. As the several pick-ups 12 are capable of independent control by the controls 14 the musician may depress several keys 45 to provide for the production of the desired chords, etc. Immediately upon the removal of pressure from a key 45 it returns to its normal position breaking the circuit to the associated relay R, thus de-energizing the associated pick-up 12 and terminating the sound produced by that pick-up. The speaker unit 13 may be readily governed by the volume control 43.

The instrument provided by the present invention is capable of faithfully producing pure true fundamental tones when employing records bearing the sound bands 57, or may be provided with records 15 having sound bands 57^a whereby it may produce fundamental tones with one or more overtones. The instrument may embody a unit 10 having records 15 bearing photographically produced sound tracks or bands 57^a to faithfully and accurately reproduce the tones of an instrument such as a pipe organ. It is to be understood that the instrument may embody a number of units 10 carrying or operating records of different characters.

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. A musical instrument comprising a frame, a plurality of pairs of drums mounted in said frame, an endless record strip carried by each

pair of said drums, said pairs being mounted so that the strips will extend radially with respect to the center of the frame, means coacting with the drums for driving the strips at predetermined speeds, non-magnetic sound tracks carried by said strips and extending longitudinally thereof, two supports mounted in said frame adjacent to each one of said endless strips, said supports being arranged in spaced parallel relation with opposed faces on either side of the coating strip and inclined with respect to the central horizontal axis of the frame, a plurality of electrostatic pickups carried by each of said strips and corresponding in number with the sound tracks on the adjacent record strips, said pickups being arranged in pairs whereby the ones on either side of the record strip will coact with the corresponding sound track as it passes between them, a loud speaker unit and means operatively connecting said unit with said electrostatic pickups whereby the tones produced by the loud speaker will be controlled by said pickups.

2. In a musical instrument of the character set forth, the combination of one or more tone producing units, each unit comprising a frame, a plurality of series of electrostatic pickups carried by each frame, means for controlling said pickups, a sound translating member operatively connected with said pickups, a plurality of sound records, each coacting with a series of pickups, means for actuating the records to cause them to move past the pickups, each of said sound records being provided with a plurality of longitudinally arranged non-magnetic sound tracks for influencing the coacting pickups.

3. In an instrument of the character set forth, the combination of a frame, a plurality of drums mounted in spaced relation around the axis of the frame, a corresponding number of drums around the outer portion of the frame, each of said last-named drums being mounted radially with respect to one of the first-named drums, an endless belt carried by each pair of drums and having a plurality of longitudinal non-magnetic sound tracks thereon, a plurality of pairs of electrostatic pickups mounted in said frame adjacent to one side of each of the belts whereby two of said pickups on either side of the coating belt will be influenced by the sound track passing between the same, means for driving said belts at predetermined speeds, and means coacting with said pickups for producing sound influenced by said sound tracks, substantially as described.

4. In an apparatus of the character set forth, an endless record belt having a plurality of longitudinal non-magnetic sound tracks, supports arranged on either side of one of the reaches of the belt, means for adjusting said supports toward and away from the belt, and a plurality of pickups carried by said supports, said pickups being arranged in pairs on opposite sides of the belt to coact with the adjacent sound tracks, and means for moving the belt to cause the sound tracks to pass between said pairs of electrostatic pickups.

VICTOR H. SEVERY.