

L. J. LE PONTOIS.

AUTOMATIC ELECTRIC PIANO PLAYER.

APPLICATION FILED AUG. 3, 1908. RENEWED MAY 3, 1912.

1,046,471.

Patented Dec. 10, 1912.

2 SHEETS—SHEET 1.

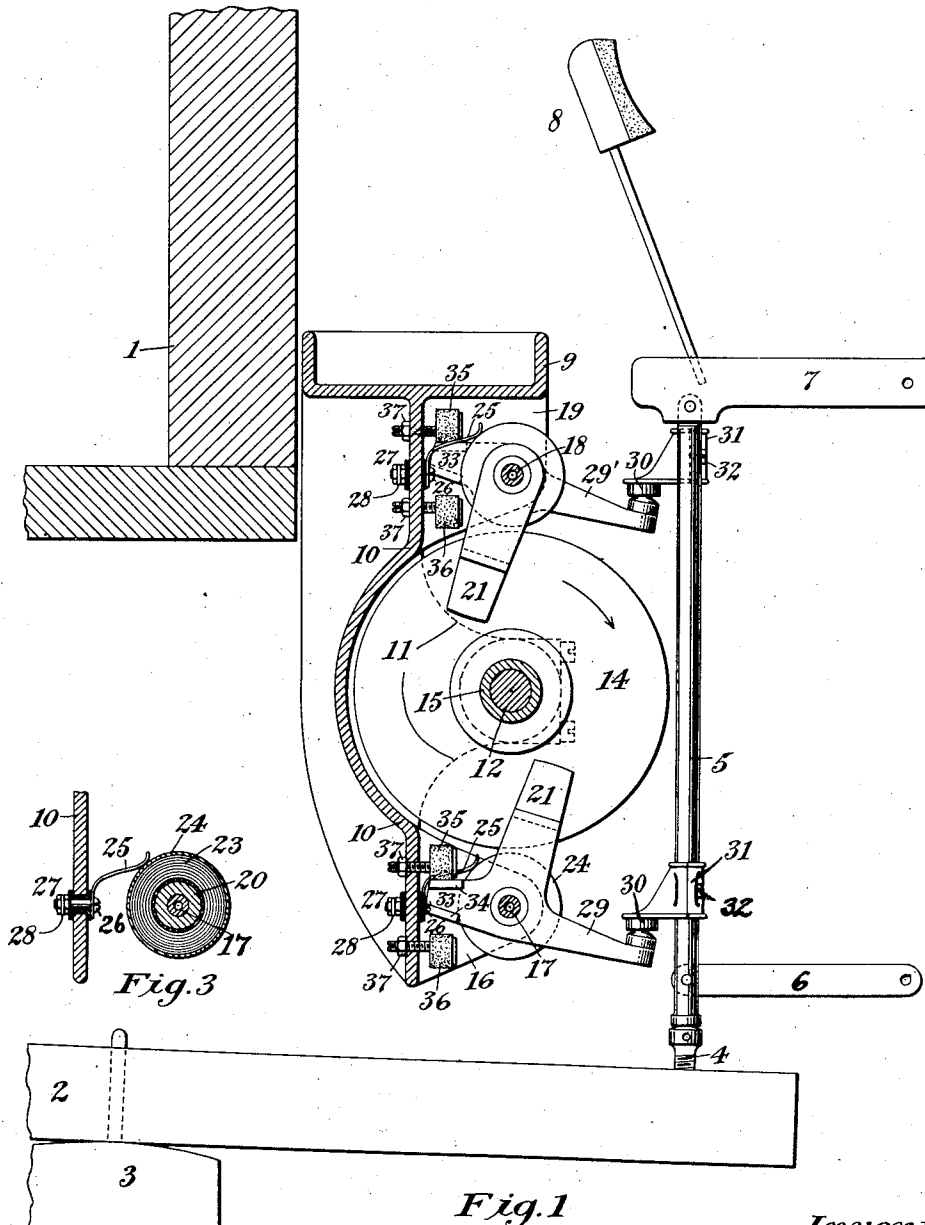


Fig. 1

Witnesses:

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Inventor:

Leon J. Le Pontois.
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his Attorneys.

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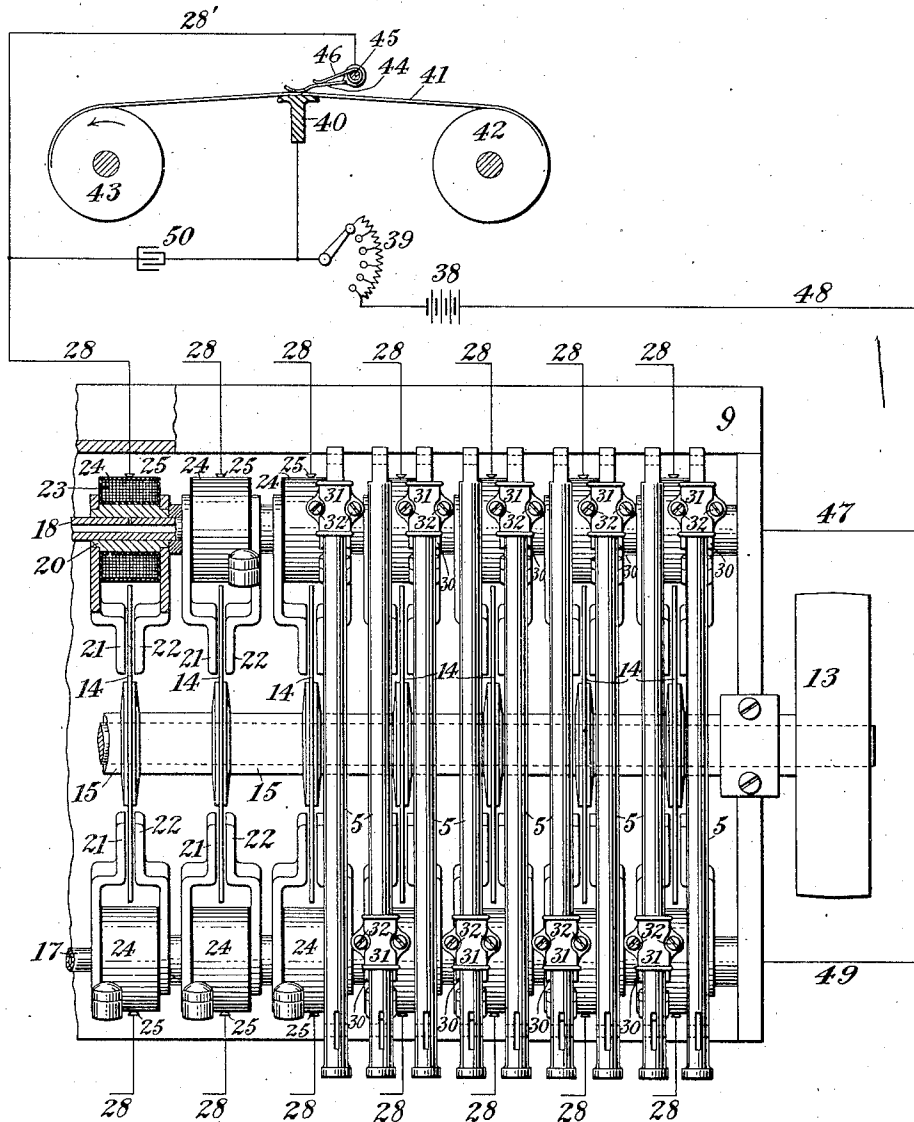


Fig. 2

Witnesses:

Geo. Hoffman.
Lac. Kern

Inventor:

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UNITED STATES PATENT OFFICE.

LEON J. LE PONTOIS, OF NEW ROCHELLE, NEW YORK.

AUTOMATIC ELECTRIC PIANO-PLAYER.

1,046,471.

Specification of Letters Patent.

Patented Dec. 10, 1912.

Application filed August 3, 1908, Serial No. 446,790. Renewed May 3, 1912. Serial No. 695,011.

To all whom it may concern:

Be it known that I, LEON J. LE PONTOIS, a citizen of the Republic of France, residing at New Rochelle, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Automatic Electric Piano-Players, of which the following is a full, clear, and exact specification.

10 My invention relates to automatic electric piano players, and more particularly to an electrically operated type.

Some of the objects of my invention are to produce automatic operating means which shall be simple in form of construction, occupy a small amount of space, and readily applicable to the usual forms of piano actions.

Another object is the adaptability of the automatic operating means to the piano in such a way that it may be concealed within the casing and also permit manual operation of the piano at any time without the necessity of any change in the mechanism.

25 These and other objects of my invention will be understood from the following description and accompanying drawings, in which—

Figure 1 is a sectional view of one form of my invention, Fig. 2 is an elevation partly in section, with certain parts removed and partly in diagram, of the electric operating means, and Fig. 3 is a detail.

Referring to the drawings, a piano action adapted for an upright piano is indicated, the front part of the piano casing being indicated at 1 in section, and one of the operating keys being shown at 2. The key is shown as pivoted on a fulcrum 3, the inner end of the key having a capstan screw 4 adapted to engage the lower end of an operating abstract or extension 5 pivotally connected to arm or link 6 and arm or wippen 7, which in turn are pivoted to fixed supports. The wippen 7 is shown as carrying the operating back check 8.

The parts thus far described illustrate one form of the usual manually operated parts, and the parts affected by the back check 8 are so well understood that the remainder of the usual mechanism need not be described.

It will be understood that all of the operating keys and parts controlled thereby are of the usual general form above described.

Within the casing of the piano and in front of the actuating parts already described, is a supporting frame 9 extending from one end of the piano to the other and having a portion 10 depending therefrom. This supporting frame is preferably of web or skeleton form, as indicated. From the portion 10 of the frame extends a plurality of supports 11 having bearings for a main shaft 12, driven by a pulley 13. The pulley or other driving means for the shaft may be driven in any suitable manner, either manually, or mechanically, such as by an auxiliary motor. Fixed to and rotating with the shaft 12 are a series of metal disks 14 preferably of some low resistance material, such as copper, or of magnetic material preferably copper plated and spaced from each other by sleeves 15 on the shaft 12. Supported by a plurality of extensions 16 from the portion 10 is a fixed hollow shaft or rod 17 preferably of bronze or other non-magnetic material, and above the rotating disks is another similar fixed shaft or rod 18 supported by a plurality of extensions 19 from the frame 9, 10. Pivotally mounted upon the rod 17 are a plurality of electromagnets, each comprising a soft iron core 20 and poles 21 and 22 embracing opposite sides of one of the disks 14. Around the core 20 of each electromagnet is wound a coil of wire 23, one terminal of which is grounded through the core and shaft 17 or 18 and the other terminal of which is electrically connected to a metal sleeve 24 surrounding the coil. Upon the outer surface of the sleeve 24 presses a contacting brush 25 fixed to the portion 10 of the frame but insulated therefrom, a screw 26 serving to secure the brush 25 in position and providing a terminal 27 for connection of a wire 28 in the controlling circuit. At one side of the electro-magnet the pole is provided with an extension 29 having a contacting part adapted to mechanically engage an extension 30 from a sleeve 31 fixed upon one of the operating extensions 5. The sleeve 31 is shown as fixed in position by a screw 32, which affords means for adjusting the sleeve to any suitable position on its extension. Another extension 33 from the side plate or pole of the electro-magnet extends in the opposite direction from the extension 29 and carries pads or cushioning parts 34 adapted to engage respectively with stops 35, 36, which are fixed to the portion 10 of the main frame. The

stops 35, 36 are shown as screw bolts carrying eccentrically mounted parts, so that by turning either one or both of these stops, the range of movement of the electromagnet, which is pivotally mounted upon the rod 17, will be limited in each direction, as desired. The nuts 37 will serve to secure the adjustable stops 35, 36 in any desired position.

On the rod or shaft 17 are a number of electromagnets of the form above described each of which coöperates with one of the extensions 5, and, as shown in Fig. 2, successive magnets coöperate with alternate extensions 5 respectively. On the shaft or rod 18 are a series of similar electromagnets embracing the upper portion of the rotating disks 14 so that each of the disks is shown as being embraced by an upper and a lower electromagnet of similar construction. The upper series of magnets have extensions 29' coöperating with sleeves 31 fixed to the upper portions of alternate extensions 5, and it will be noted that the extensions 29' are on the opposite sides of the upper magnets from the sides of the lower magnets from which the extensions 29 project. This secures a staggered relation of the extensions and enables the upper set of magnets to act upon alternate extensions 5 which are not acted upon by the lower set of magnets. Otherwise the upper set of magnets are similar to the lower set and the parts are correspondingly numbered. The rods 17 and 18 are preferably hollow and provided with radial perforations whereby oil may be introduced and distributed to the bearings between the magnets and supporting shafts.

The connections of the controlling magnets will be understood from Fig. 2. A source of electromotive force is indicated at 38 from which one lead extends through a regulation rheostat 39 to a main metallic terminal or busbar 40. The perforated music sheet of usual form is indicated at 41 passing from the usual roll 42 to the receiving roll 43 which may be supported and operated in any desirable manner. The perforated sheet passing from one roll to the other passes over the main terminal bar 40, the end of which is shown in Fig. 2. Over the perforated sheet are mounted a plurality of brushes or contacts 44, the number thereof corresponding to the number of controlling electromagnets. The brushes or contacts 44 are supported upon a rod 45 which may be of insulating material in order to insulate the brushes 44 from each other, or if desired the brushes may otherwise be insulated. The brushes 44 are arranged to press against the perforated sheet where the same passes over the main terminal bar 40 and this pressure may be caused by providing a spring 46 for each contact brush. The brush 44 is shown in Fig. 2 as connected by a lead 28' to the lead 28 connected to one of the

brushes 25 bearing upon the outer sleeve of a coil of one of the electromagnets and the current may pass through the coil to its core and supporting rod 18 and thence by connections 47 and 48 back to the other terminal of the source 38. It will be understood that each brush 44 is connected by an independent lead to its corresponding electromagnet and that the circuits of each will correspond to the circuit already traced of one of the magnets, the circuits from the upper set of magnets being completed through the rod 18 and connection 47 to the source and the circuits from the lower set of magnets being completed from the rod 17 and connection 49 to the source. Between each lead 28 from each magnet and the main terminal 40 may be connected if desired a suitable condenser 50; thus there will be the same number of condensers as there are controlling magnets and keys. The brushes 44 are spaced in such relation to the perforated sheet 41 that each brush will be in alinement with the series of perforations for operating a certain key, and as the sheet passes over the main terminal bar 40, the brushes corresponding to the perforations in the sheet will be pressed against the terminal bar 40 making contact therewith and close the circuit from the source through the respective electromagnets and back to the source. Thus, each electromagnet will be excited to correspond with the perforations in the sheet 41.

Considering now the action of the electromagnets and the coöperating disks, it will be understood that the passing of a current through a coil of one of the magnets will cause the poles thereof to be magnetized and a comparatively strong magnetic field will exist between the pole faces 21, 22 which embrace the disk 14. The constant rotation of all of the disks by a suitable source of power will cause eddy currents to be induced in the disk corresponding to the magnet which is excited and the electromagnetic action which results will cause the poles of the magnet which is excited to be quickly moved in the direction of rotation of the driven disk, the direction of motion being indicated by the arrow in Fig. 1. The magnet will therefore be caused to turn about its supporting rod and the extension 29 or 29' thereof will act to raise its corresponding extension 5 and operate the hammer controlled thereby. Thus, whenever one or more magnets are excited, the action of the disks will cause the extensions and hammers corresponding thereto to be actuated either successively or simultaneously corresponding to the perforations in the sheet 41. The upper set of electromagnets are so weighted or proportioned that they will normally assume the position shown in Fig. 1, the pad 34 resting against the stop 35.

The excitation of one or more of the upper magnets causes the downwardly extending pole or poles to be forced to the right and operate the corresponding hammer or hammers, the stops 36 serving to limit the movement of the magnets. The lower set of magnets are so proportioned or weighted that they will normally assume the position shown in Fig. 1, and when one of the lower magnets is excited, the upwardly extending pole will be thrown to the left by the action of the disk and thus serve to actuate its corresponding stem and hammer, the stop 36 limiting the movement of the electromagnet.

It will be understood by those skilled in the art that the main source of energy for operation of the magnets is derived from the means which constantly drives the disks 14. The exciting current required for the magnets is very small, it being necessary merely to cause sufficient current to flow to produce a magnetic field which is weak compared to usual forms of actuating magnets because with my invention no attraction of armatures normally at rest is necessary. In the latter form of devices, the exciting current required or ampere turns of the magnet is comparatively large since the magnet must be the source of all of the energy for producing movement. In accordance with my invention however, the main source of the energy for operating the movable parts is derived from the means for rotating the disks as above mentioned, the magnets serving to supply only a very small percentage of the total energy. Thus very small currents and small ampere turns are sufficient in my improved form of operating means and consequently, the sparking between the brushes 24 and main terminal bar 40 will be inappreciable. I therefore overcome a serious difficulty previously encountered with automatic electric operating means.

It is apparent that my invention has the advantage of securing simplicity in structure, compactness, unitary structure adapted to be readily applied to or removed from pianos of the usual type, besides securing durability and freedom from the necessity of frequent repair or inspection.

Although I have shown and described one form of my invention, it will be understood that various modifications may be made without departing from the scope thereof.

Having thus described my invention, I declare that what I claim as new and desire to secure by Letters Patent, is,—

1. In an electric piano player, the combination with a piano action, of an electro-mechanical actuating device, comprising a movable electric conductor, a movable electromagnet having poles embracing said conductor for inducing electric currents within said conductor upon relative movement be-

tween said poles and said conductor, electrical means adjustable at will for energizing the exciting coil of said electromagnet for producing a desired actuation, and means affected by the movement of said electromagnet for operating a hammer of the piano action.

2. The combination with a piano action, of an electromagnetic actuating device, comprising a driven conducting element, a movable electromagnet having poles embracing said element, means adjustable at will for energizing the exciting coil of said electromagnet for producing a desired actuation, and means affected by the movement of said electromagnet for operating a hammer of the piano action.

3. In an electric piano player, the combination with a piano action of an electro-mechanical actuating device comprising a rotating metallic disk, an electromagnet having poles embracing said disk, electrical means adjustable at will for energizing the exciting coil of said electromagnet to produce a desired actuation, and means affected by the movement of said electromagnet for actuating a hammer of the piano action.

4. The combination with a piano action, of an electro-magnetic actuating device, comprising a driven conducting element, an electromagnet having poles embracing said element, means for pivotally mounting the poles of said electromagnet, means variable at will for controlling the excitation of said electromagnet, and means affected by the movement of said electromagnet for operating a hammer of the piano action.

5. In an electric piano player, the combination with a piano action of an electro-mechanical actuating device, comprising a rotating metallic disk, an electromagnet having poles embracing said disk, means for pivotally mounting said electromagnet, electrical means adjustable at will for energizing the exciting coil of said electromagnet, and means affected by the movement of said electromagnet for operating a hammer of the piano action, whereby a desired actuation of the piano action is obtained at will.

6. The combination with a piano action, of an electro-magnetic actuating device, comprising a rotating conducting disk, an electromagnet having poles embracing the faces of said disk, means for pivotally mounting the poles of said electromagnet eccentrically with respect to said disk, means for closing the circuit through the coil of said electromagnet, and means operated by said electromagnet for actuating a hammer of the piano action.

7. In an electric piano player, the combination with a piano action of an electro-mechanical actuating device, comprising a rotating conducting disk, an electromagnet having poles embracing said disk, means for

pivotaly mounting said electromagnet, electrical means adjustable at will for energizing the exciting coil of said magnet, and means affected by the movement of said electromagnet for causing the operation of a hammer of the piano action.

8. In an electric piano player, the combination with a piano action, of an electro-mechanical actuating device, comprising a rotating metallic disk, an electromagnet having poles embracing said disk, means for pivotaly mounting said electromagnet, means affected by the movement of said electromagnet for causing the operation of a hammer of the piano action, a perforated sheet, and means including an adjustable current controlling element for closing the electric circuit of the exciting coil of the electromagnet corresponding to perforations in said sheet.

9. The combination with a piano action, of an electro-magnetic actuating means, comprising a rotating conducting element, two electromagnets in inductive relation to said element, means for movably mounting the poles of said electromagnets eccentrically with respect to said element, means for closing the circuits through the exciting coils of said electromagnets, and means affected by the movement of said electromagnets for causing the operation of some of the hammers of the piano action.

10. In an electric piano player, the combination with a piano action of an electro-mechanical actuating device, comprising a rotating metallic disk, two electromagnets having poles embracing said disk, means for movably mounting the poles of said electromagnets, said mounting means being eccentric with respect to said disk, electric means for energizing the exciting coils of said electromagnets, and means affected by the movement of said electromagnets for effecting the operation of some of the hammers of the piano action.

11. In an electric piano player, the combination with a piano action of an electro-mechanical actuating device, comprising a rotating metallic disk, two electromagnets related to said disk for inducing currents therein, means for movably mounting the poles of said electromagnets, adjustable electrical means for energizing the exciting coils of said electromagnets, and means affected by the movement of said electromagnets for effecting the operation of some of the hammers of the piano action, whereby the desired actuation of the piano action is obtained.

12. In an electric piano player, the combination with a piano action of an electro-mechanical actuating device, comprising a movable metallic conductor, a plurality of electromagnets in inductive relation to said conductor, means for movably mounting the

poles of said electromagnets, electrical means adjustable at will for energizing the exciting coils of said electromagnets, and means affected by the movement of said electro-magnets for operating hammers of the piano action.

13. The combination with a piano action, of electromagnetic actuating means, comprising a plurality of driven conducting elements, a plurality of movably mounted electromagnets in inductive relation to said elements, a perforated sheet, means including an adjustable current controlling element for closing the circuits through the coils of said electromagnets corresponding to the perforations in said sheet, and means affected by the movement of said electromagnets for operating the piano action.

14. The combination with a piano action, of electro-dynamic actuating means, comprising a driven conducting element, means for driving said element, a movable device in inductive relation to said element, said movable device being mounted eccentrically with respect to said driven element, and means affected by the movement of said device for effecting the operation of some of the hammers of the piano action.

15. The combination with a piano action, of electro-dynamic actuating means, comprising a driven conducting element, means for driving said element, a movable device for creating a magnetic field in relation to said element for inducing electric currents therein, means for controlling the strength of the magnetic field, and means affected by the movement of said device for effecting the operation of some of the hammers of the piano action, whereby a desired operation of the piano action is obtained.

16. In an electric piano player, the combination with a piano action, of electro-dynamic actuating means, comprising a plurality of driven conducting elements, a plurality of movable electro-magnets having poles embracing the said elements and in inductive relation thereto, said electro-magnets being mounted eccentrically with respect to said elements, means affected by the movement of said electromagnets for causing the operation of the piano action, and a unitary support for said electro-dynamic means.

17. In an electric piano player, the combination with a piano action of an electro-mechanical actuating device, comprising a plurality of rotating metallic disks, a plurality of electromagnets in inductive relation to said disks, means for pivotaly mounting said electromagnets eccentrically with respect to said disks, means affected by the movement of said electromagnets for causing the operation of the piano action, a perforated sheet, and means for closing the electric circuits of the exciting coils of the

electromagnets corresponding to perforations in said sheet.

18. The combination with a piano action, of electro-magnetic actuating means, comprising a plurality of driven conducting elements, a plurality of electromagnets having poles embracing said driven elements, means for movably mounting the poles of said magnets, said mounting means being eccentric with respect to said elements, eccentric adjustable means for limiting the movement of said poles, and means for exciting the coils of said magnets.

19. In an automatic piano player, the combination with a piano action of an electro-mechanical actuating device, comprising a movable electric conductor, movable means adapted to induce electric currents in said conductor upon relative movement between said conductor and said movable means, means for controlling the strength of the induced electric currents, and means in operative relation to said movable means for operating the piano action, whereby a desired operation of the piano action is obtained.

20. In an automatic piano player, the combination with a piano action of an electro-mechanical actuating device, comprising a movable electrically conducting disk, movable means in inductive relation to said conducting disk, means for mounting said movable means eccentrically with respect to said disk, and means in operative relation to said movable means for causing the operation of some of the hammers of the piano action.

21. In an automatic piano player, the combination with a piano action of an electro-mechanical actuating device, comprising a rotatable conducting disk, movable means in inductive relation to said conducting disk, means for mounting said movable means eccentrically with respect to said disk, means

in operative relation to said movable means for causing the operation of some of the hammers of the piano action, and a unitary support for said actuating device.

22. In an electric piano player, the combination with a piano action of an electro-mechanical actuating device, comprising a movable metallic conductor, a plurality of electro-magnets in inductive relation to said conductor, and means for movably mounting the poles of said electro-magnets, said mounting means being eccentric with reference to said conductor.

23. In an automatic piano player the combination with the piano action of an electromechanical actuating device, comprising rotating electrical conducting disks, movable means in operative relation to said conducting disks for inducing electric currents therein, means for pivotally mounting said movable means eccentrically with respect to said rotating disks, whereby said electric currents react to cause the movement of said movable means, and means in operative relation to said movable means for operating the piano action at will.

24. In an electric piano player, the combination with a piano action of an electro-mechanical actuating device, comprising a plurality of rotating metallic disks, a plurality of electro-magnets in inductive relation to said disks, means for movably mounting the poles of said electro-magnets eccentrically with respect to said disks, and means affected by the movement of said electro-magnets for operating the piano action.

In testimony whereof I affix my signature, in presence of two witnesses.

LEON J. LE PONTOIS.

Witnesses:

GEO. O. HOFFMAN,
L. K. SAGER.