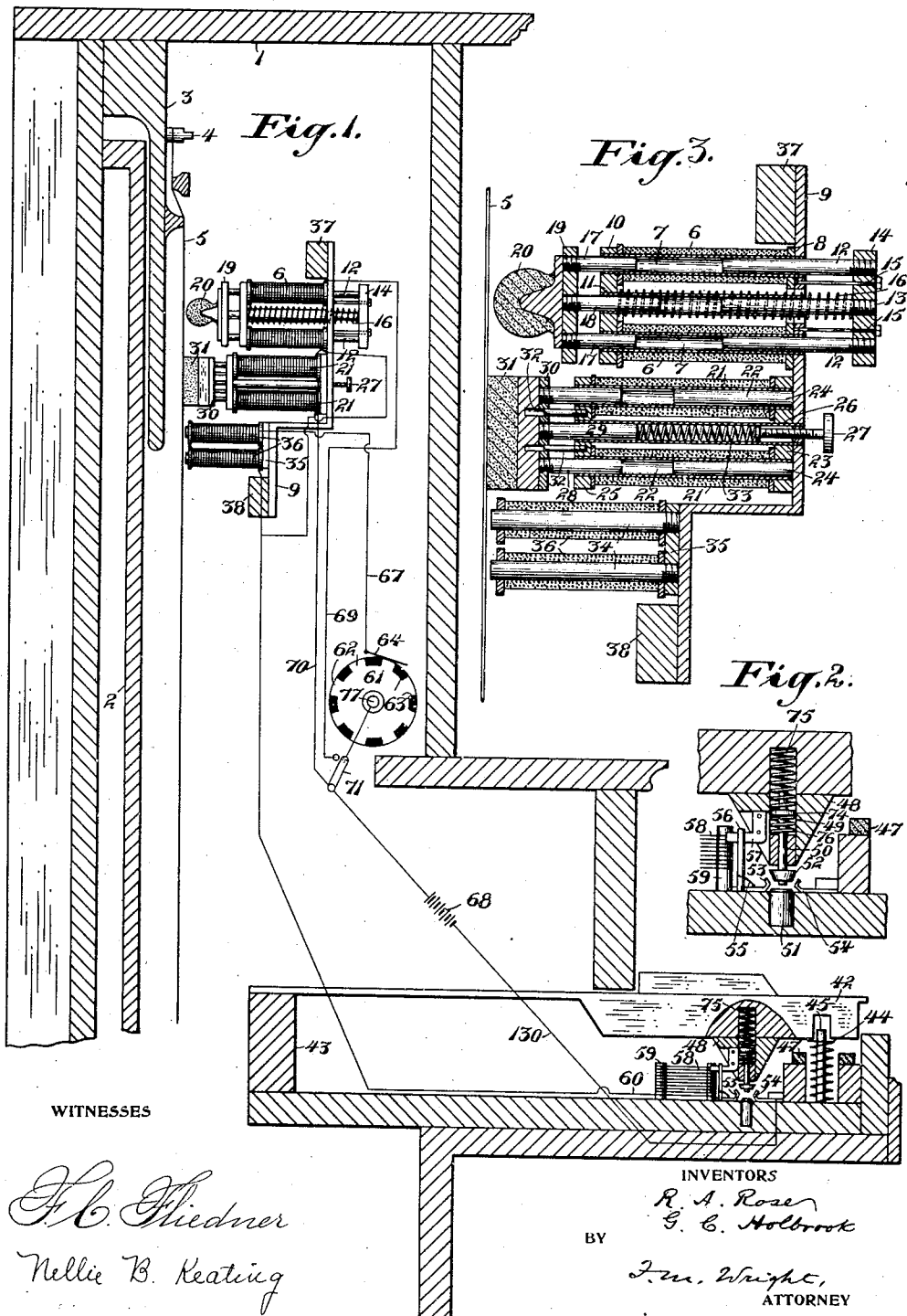


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ELECTRICAL PIANO.
APPLICATION FILED MAR. 29, 1909.

962,261.

Patented June 21, 1910.



UNITED STATES PATENT OFFICE.

ROBERT A. ROSE AND GEORGE C. HOLBROOK, OF SANTA ROSA, CALIFORNIA.

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Specification of Letters Patent. Patented June 21, 1910.

Application filed March 29, 1909. Serial No. 486,394.

To all whom it may concern:

Be it known that we, ROBERT A. ROSE and GEORGE C. HOLBROOK, citizens of the United States, residing at Santa Rosa, in the county of Sonoma and State of California, have invented new and useful improvements in Electrical Pianos, of which the following is a specification.

The present invention relates to electrical pianos, the object of the invention being to provide improved electric means for actuating and controlling the hammers and dampers of the piano.

The invention resides in the novel construction and arrangement of parts hereinafter described and more specifically pointed out in the claims.

In the accompanying drawing, Figure 1 is a vertical transverse section of the upper portion of a piano equipped with our invention, certain parts being shown diagrammatically; Fig. 2 is an enlarged detail sectional view of the key mechanism; Fig. 3 is an enlarged vertical section through the magnets.

Referring to the drawings, 1 indicates the usual case containing the sounding board 2, the string plate 3, the tuning pins 4 and the strings 5.

Hammer magnets.—The hammer magnets are formed of two coils 6 wound on non-magnetic tubes 7, fastened at the outer ends to a non-magnetic yoke 8, the latter being secured to a brass plate 9, and at their inner ends to a magnetic yoke or stay 10. To said stay 10 is also secured between the tubes 7, the inner end of a guide tube 11, preferably of brass, its outer end projecting through the outer yoke 8 and into an opening in the brass plate 9. Within said tubes 7 and 11 reciprocate plungers 12, 13, the two plungers 12 being of magnetic material, while the plunger 13 may be magnetic or non-magnetic, as convenient. The plungers, 12, 13, are secured to a magnetic yoke 14, which reciprocates freely upon guide rods 15, and said plungers and yoke are normally pressed outward or forward by a coiled spring 16 coiled around the tube 11. In the inner ends of the tubes 7 and 11 are plungers 17, 18, connected to a non-magnetic yoke 19, upon which is mounted a hammer 20 adapted to strike the piano strings 5. The outer plungers 17 are of magnetic material and of such length that, when the hammer 20 is in contact with the string, the front ends of said

plungers will be just within the helical coils 6. The plunger 18 is of non-magnetic material and of such length that, when it is in its outermost or forward position, the plunger 13 being in its innermost position, there is a space of about one-eighth of an inch between them, thus permitting the hammer to rebound from the string and to be held in its retracted position by the pull of the electro-magnet.

The operation of the hammer magnets is as follows: Upon the circuit of any note being closed, the plungers 12 are drawn into the helices, as are also the plungers 17, 18, should they, as shown in Figs. 1 and 3, not have been completely withdrawn thereinto, as after playing a note staccato, and the plunger 13 will strike the plunger 18, and cause the hammer to be projected against the string. Upon rebounding, the hammer will be held in its retracted position so long as the circuit remains closed. Upon the circuit being opened, the spring 16 will cause the plunger 13 and yoke 14 to resume a position ready for another stroke.

Damper magnets.—The damper magnets comprise two helical coils 21, wound on non-magnetic tubes 22, secured at their outer ends to a magnetic yoke 23 mounted on the brass plate 9, and within which tubes for a portion of their length are the magnetic cores 24. The inner ends of the tubes 22 are held in place by a non-magnetic yoke 25. Between these coils, and passing through both yokes 23 and 25 is a tube 26, having at its outer or front end an adjusting screw 27. Within the tubes 22 and 26 reciprocate the magnetic plunger 28 and non-magnetic plunger 29, mounted on a yoke 30 of magnetic material, which also carries a damper 31 and is guided by rods 32. A coiled spring 33 within the tube 26 holds the damper against the string 5 until the circuit is closed, when the damper is drawn away from the string by the electro-magnets.

Sustaining magnets.—The sustaining magnets consist of the magnetic cores 34, screwed into a magnetic yoke 35, around said cores being wound the electrical coils 36.

All of the front yokes, for the hammer magnets, damper magnets, and sustaining magnets for each note, are secured to the single piece of brass 9 so as to be readily removable, all of said pieces 9 being secured to upper and lower longitudinal bars 37, 38.

Key mechanism.—42 indicates a finger key of the piano, its rear portion being sufficiently thin as to be resilient, and secured at the rear end upon a suitable longitudinal base 43. Said finger key is normally pressed upward by means of a spring 44 coiled around a guide stem 45. Pads of felt 47 are suitably located to receive the impact of the finger key when it is depressed.

48 indicates a block secured to the under side of the finger key, and, in a socket 49 in said guide piece and finger key, is a plunger 50 of magnetic material. The lower end of said plunger is, in the normal position of the finger key, adjacent to a permanent magnet 51, and near said lower end, said plunger carries a conical contact collar 52, which is adapted, when the plunger is depressed, to contact with, and electrically connect, two contacts 53, 54. The contact 53 is connected by a wire 55 with a post 56, along which slides a metallic arm 57 carried by the block 48, the end of said arm sliding over a coil 58 of high resistance wire wound around posts 59 on the frame. The other end of said coil 58 is connected by a wire 60 with the sustaining magnets 36, the damper magnets 21, and the hammer magnets 6 in parallel. The contact 54 connects by a wire 130 through a battery 68 and switch 71 with the center of a rotating circuit breaker 61 rotating on a shaft 77, the periphery of which is divided into a suitable number of contacts 62 separated by insulating portions 63. Said circuit-breaker is rotated under a brush 64, which is connected by a wire 67 to the sustaining magnets 36. Branch wires 69, 70, the former controlled by a switch 71 lead to the damper and hammer magnets.

To avoid sparking between the lower end of the plunger 50 and the contacts 53, 54, which would very quickly impair the efficiency of the piano action, the following provision is made. The plunger is provided with a collar 74 rigidly secured thereto, and around the plunger, on opposite sides of said collar, and within the recess formed in the block, are two coiled springs 75, 76 of the same strength. These springs act in opposite directions, and tend always to center the collar within the socket, and they have the effect of making a quick acting break between the plunger and its contacts. Thus, when the key has been depressed so that the lower end of the plunger approaches near enough to the permanent magnet to be moved thereby against the action of the lower spring 76, the magnetism of said magnet, overcoming the action of the spring makes a quick connection between the plunger and magnet. On the other hand, when the key is raised, the effect is, first, to

compress the lower spring, the plunger remaining still in contact with the magnet, until said spring has been compressed to such an extent that its pressure overcomes the attraction of the magnet, whereupon the plunger makes a quick break from the magnet and from the contacts 53, 54.

We claim:—

1. In an apparatus of the character described, the combination with strings, of hammers therefor, and electro-magnets for propelling said hammers against the strings, and for withdrawing the same therefrom, substantially as described.

2. In an apparatus of the character described, the combination with strings, of hammers having parts attached thereto, solenoids, cores attached to the hammers and arranged to be attracted by the solenoids, and cores arranged to be attracted by the solenoids in the opposite direction to the first-mentioned cores, and, when so attracted, to impinge upon the parts attached to the hammers, and propel the latter against the strings, substantially as described.

3. In an apparatus of the character described, the combination with strings, of hammers having parts attached thereto, solenoids, cores attached to the hammers and arranged to be attracted by the solenoids, and cores arranged to be attracted by the solenoids in the opposite direction to the first-mentioned cores, and, when so attracted, to impinge upon the parts attached to the hammers, and propel the latter against the strings, and springs for returning the propelling cores to their normal position, substantially as described.

4. In an apparatus of the character described, the combination, with strings, of hammers having parts attached thereto, solenoids arranged at right angles to said strings and immediately behind the hammers, frames carrying said solenoids, and provided with means for guiding the hammers to and from the strings and in a direction at right angles thereto, cores in said solenoids detached from the hammers, said solenoids being arranged to attract said cores to cause them to impinge upon said parts attached to the hammers, and propel the hammers against the strings, and springs for withdrawing the cores, substantially as described.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

ROBERT A. ROSE.

GEORGE C. HOLBROOK.

Witnesses:

FRANCIS M. WRIGHT,

D. B. RICHARDS.