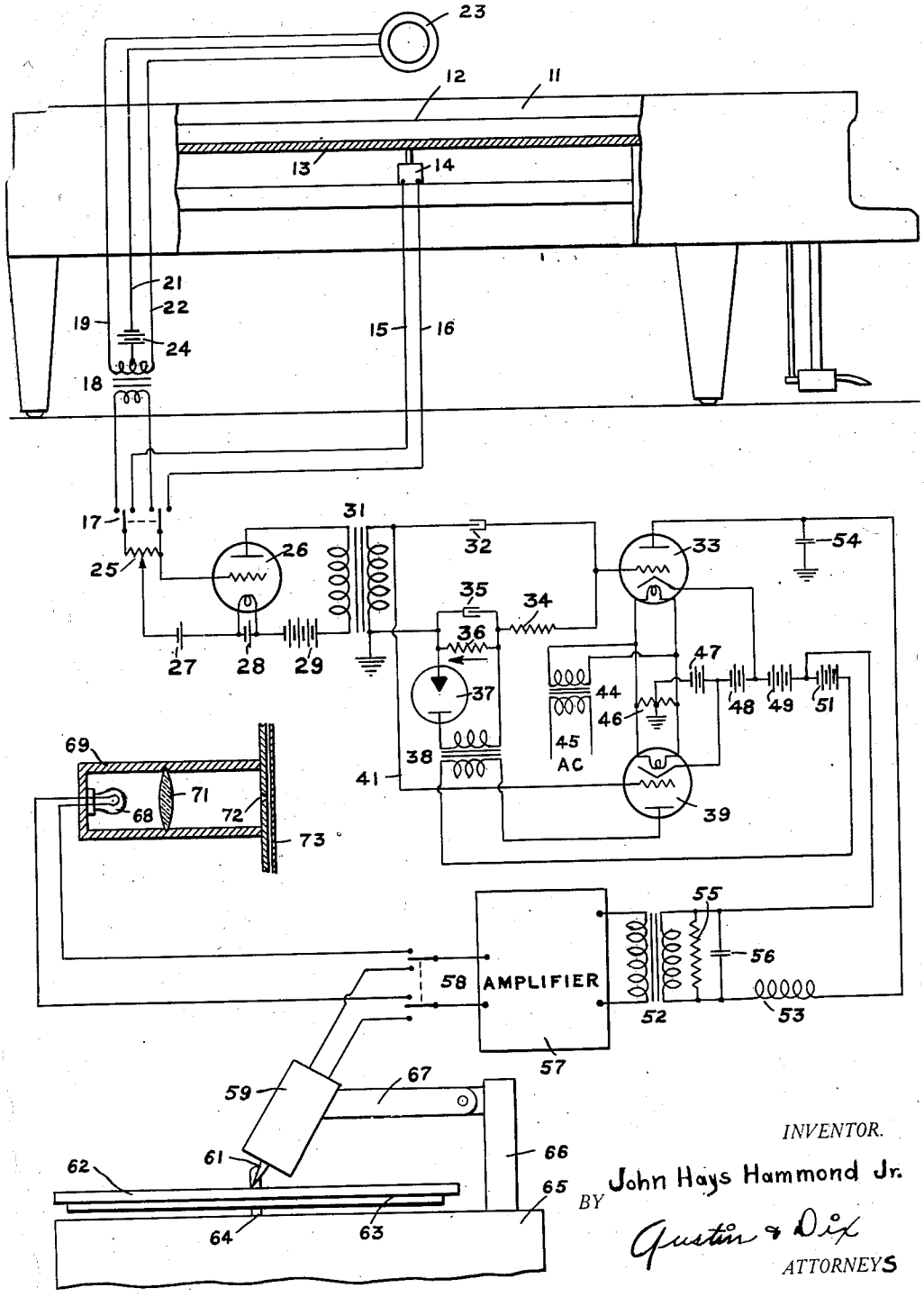
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PIANO RECORDING

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PIANO RECORDING

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8 Claims. (Cl. 179—100.4)

This invention relates to musical instruments and more particularly to an improved means for recording the music therefrom.

The invention relates particularly to the recording of the music of a piano and means for eliminating the thump in this music which is produced when the hammers hit the strings of the instrument.

The invention further provides means for picking up the music of the piano either from the sound board or from a microphone located over the strings and for recording this music on a permanent record such as on a phonograph disk record or on a moving photographic film.

The invention also consists in certain new and original features of construction and combinations of parts hereinafter set forth and claimed.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, the mode of its operation and the manner of its organization may be better understood by referring to the following description taken in connection with the accompanying drawing forming a part thereof, in which the single figure represents diagrammatically a system according to the invention.

In the following description and in the claims, parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit.

Referring to the form of the invention shown in the accompanying figure, a piano 11 is provided with the usual strings 12 and sounding board 13. Connected to this sounding board is an electro magnetic pickup device 14 which is connected by two conductors 15 and 16 to one set of poles of a double pole, double throw switch 17. The other set of poles of this switch is connected to the secondary of a transformer 18, the primary of which is connected by three wires 19, 21 and 22 to a microphone 23. In the line 21 is a battery 24.

To the other side of switch 17 is connected a potentiometer 25, which is connected to the input circuit of a space discharge device 26. A biasing battery 27 is provided in this circuit. The filament of the device 26 is heated by a battery 28. The output circuit of this device includes a B-battery 29 and the primary of a transformer 31. One side of the secondary of the transformer 31 is connected through a blocking condenser 32 to the grid of a space discharge amplifier 33. This grid is connected through a resistance 34 to a condenser 35, the other side of which is connected to the secondary of the transformer 31. Across the condenser 35 is a biasing resistance 36.

Across this resistance 36 is connected in series a rectifier 37, and the secondary of a transformer 38. One side of the primary of the transformer 38 is connected to the plate of a space discharge device 39. The grid of this device is connected by a conductor 41 to one side of the secondary of the transformer 31.

The filaments of the devices 33 and 39, are supplied with alternating current through a transformer 44 from a supply 45. A resistance 46 is connected across the filaments of devices 33 and 39. The central point of this resistance is grounded and is also connected to a battery 47, the other side of which is connected to the cathode of the device 39 and also to a battery 48. The other side of this battery is connected to the cathode of the device 33 and to a battery 49. The other side of this battery is connected to a battery 51 and also to one side of the primary of a transformer 52. The other side of the battery 51 is connected to the primary of the transformer 38.

The other side of the primary of the transformer 52 is connected through an inductance 53 to the plate of the device 33. This plate is connected to ground through a condenser 54. Across the primary of the transformer 52 is a resistance 55 and a condenser 56.

The secondary of the transformer 52 is connected to the input of an amplifier 57, the output of which is connected to a double pole, double throw switch 58. One set of poles of this switch are connected to a phonograph engraving mechanism 59, which is provided with an engraving tool 61, which is used for engraving a record 62. This record is carried on a turn table 63 mounted on a shaft 64, which is rotated by standard phonograph mechanism mounted in a casing 65. Rotatably mounted on this casing is a bracket 66 to which is pivoted an arm 67 which carries the engraving mechanism 59. The bracket 66 is slowly rotated by means of a mechanism in the casing 65 so that the engraving tool 61 is caused to cut a spiral groove in the record 62 in a manner well known in the art.

The other poles of the switch 58 are connected to a variable intensity lamp 68 which is mounted in a casing 69. Mounted in this casing is a lens 71 which focuses the light from the lamp 68 through a slit 72 on to a moving photographic film 73, which is used for recording the piano music.

In the operation of the system shown in the accompanying figure, if it is desired to pick up the music from the piano by the microphone 23, the switch 17 is thrown to the left, thereby connecting the microphone to the input circuit of the device 26 through the potentiometer 25. If, however, it is desired to pick up the music of the piano from the sound board 13, the switch 17

is thrown to the right, thereby connecting the pickup device 14 to the input circuit of the device 26. The current from either the microphone 23 or the pickup device 14 is amplified by the amplifier 26. The output voltage from the transformer 31 then passes through the stoppage condenser 32 to the amplifier 33 and also to the control device 39. The amplified current from the control device 39 passes through the transformer 38 and is rectified by the rectifier 37.

This rectified current flows through the resistance 36 in the direction of the arrow causing a potential difference to be built up across this resistance which is proportional to the current flowing through it and therefore to the input signal strength. In this way, as the signal increases an increasing positive potential will be built up on the grid of the device 33 thereby decreasing its impedance and therefore increasing its amplification factor and gain ratio. As the capacity 35 is large, this action will be comparatively slow, so that during a brief interval, after the note is struck the amplification factor will be small thus preventing a sudden surge of the amplified energy. The amplification factor, however, will gradually increase, so that after the initial peak due to the blow on the string is over the amplification factor will increase to a maximum and then gradually decrease as the input energy decreases.

The amplified current from the device 33 then passes through the transformer 52 to the amplifier 57, where it is amplified and fed either to the phonograph engraving mechanism 59 for recording on the record 62 or to the variable light source 68 for recording on the film 73, depending on whether the switch 38 is thrown down or up.

The circuit consisting of the condenser 35 and the resistance 36 forms a delay action system, the time of action of which may be varied as desired by suitably proportioning the capacity and resistance. The time of delay determines how much of the initial energy of each note is withheld and thus the amount of thump that is eliminated.

The condensers 54 and 56 and the inductance 53 form a filter net work which cuts out any undesirable high frequency notes which may be present, thus eliminating the scratch from the record. By using this system it is thus seen that it is possible to record the playing of a piano without producing any undesirable peaks or thumps in this reproduction.

Although only a few of the various forms in which this invention may be embodied have been shown herein, it is to be understood that the invention is not limited to any specific construction, but might be embodied in various forms without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. In a sound recording system, a piano, means for picking up the vibrations of said piano, an amplifier for amplifying said vibrations, means associated with said amplifier for varying the amplification factor of same in accordance with the input signal strength so that strong signals are amplified more than weak ones, said latter means being arranged so that its action is retarded so that the initial surge of energy caused by the striking of a note is amplified less than the remaining energy of said note and means for recording said vibrations on a sound record tablet.

2. In a system for recording piano music, a piano, pickup devices associated therewith, an amplifier for amplifying the energy picked up by said devices, means associated with said amplifier for decreasing the initial surge of energy when a note is struck and means for recording the amplified energy on a sound record tablet.

3. In a sound recording system, a piano, a microphone for picking up the vibrations of the piano through the air, a sound board pickup for picking up the vibrations of the sound board, an amplifier for amplifying the energy from either the microphone or sound board pickup, means in combination with said amplifier for diminishing the energy peak due to the striking of a note and means for recording the output of said amplifier on a phonographic record blank.

4. In a sound recording system, a piano, means for picking up the vibrations of said piano, a space discharge amplifier for amplifying the energy from said pickup means, a space discharge control device associated therewith, a rectifier and a resistance in the output circuit of said control device, said resistance also being across the input circuit of said amplifier, means for causing a current to flow through said resistance which causes a positive potential to be built up on the grid of said amplifier so that the amplification factor of said amplifier is varied in accordance with the input signal strength, means for retarding the building up of said positive potential so that the amplification factor will remain small during the initial peak of energy when a note is struck and means for recording the output of said amplifier on a sound record tablet.

5. In a recording system, a piano, means for picking up the vibrations of said piano, a space discharge amplifier having an anode, a cathode and a control element, means for varying the potential on said control element in accordance with the energy picked up from said piano, means for retarding this action so that it is comparatively ineffective during the initial stages of the surge of energy when a note is struck and means for recording the output of said amplifier on a phonographic record blank.

6. In a sound recording system, a musical instrument, a pickup device associated therewith, a blank record, a recording device therefor, and means between said pickup device and said recording device for expanding the volume ratio between loud and soft notes, said means being controlled by the dynamics of the sound itself, and means for delaying expanding action to prevent recording of an initial thump when a note is played.

7. The method of recording sound which comprises picking up and amplifying sound energy, automatically varying the amplification of said energy according to the moving average thereof to increase the gain when the input energy level is high and decrease the gain when said input energy level is low and recording said amplified energy upon a sound record.

8. In a sound recording system, a pick-up device for picking up the sound to be recorded, an amplifier fed by said pick-up device, a control circuit also fed by said pick-up device for controlling the gain of said amplifier so that said gain increases with increase in the average intensity of the sound and decreases with decrease in the average intensity of the sound, a blank record, and a recording device for said record fed by said amplifier.

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