

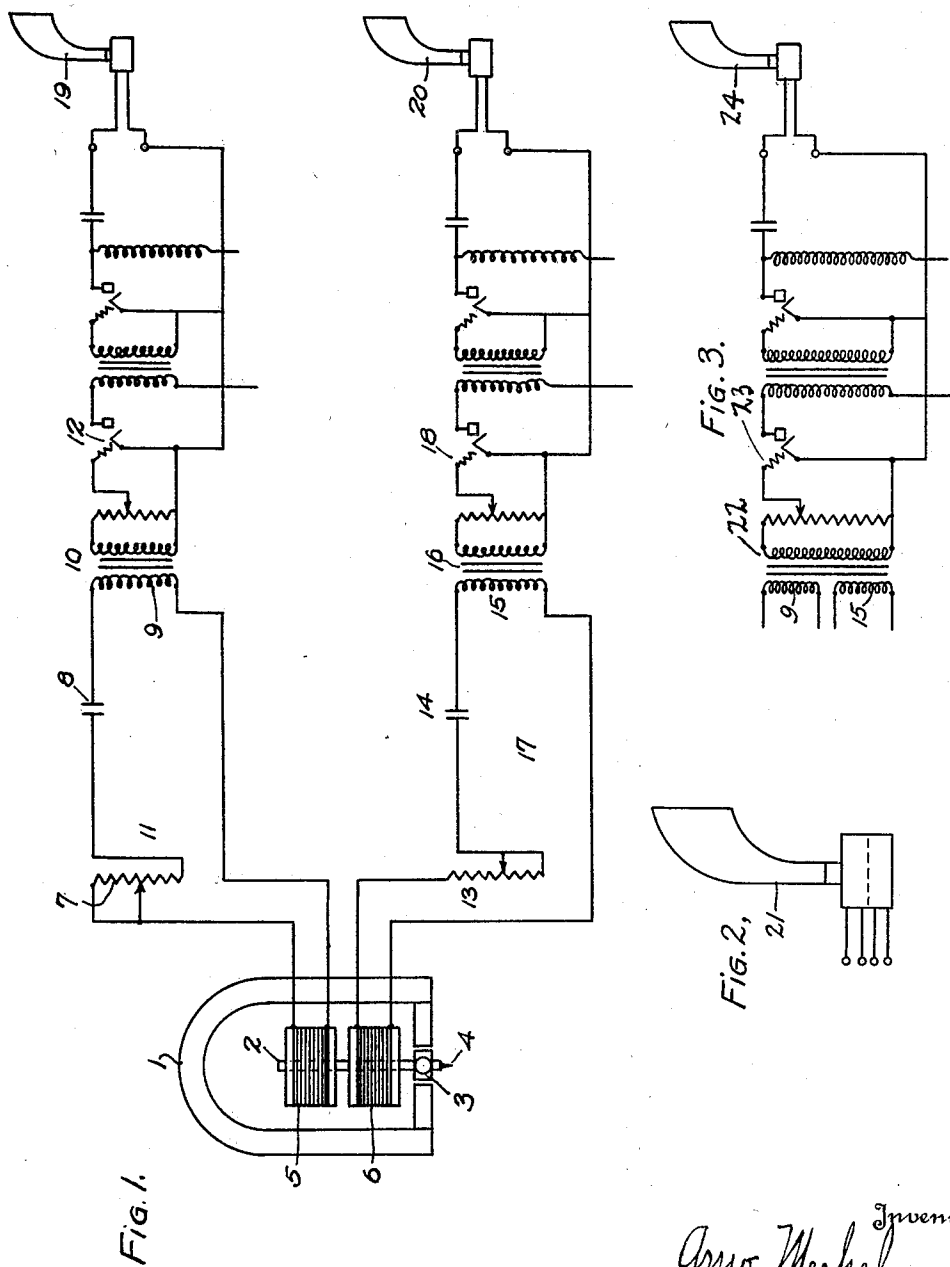
May 3, 1932.

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1,856,922

PHONOGRAPH ELECTRICAL REPRODUCER

Filed April 28, 1928



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UNITED STATES PATENT OFFICE

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PHONOGRAPH ELECTRICAL REPRODUCER

Application filed April 23, 1928. Serial No. 273,539.

This invention relates to electrical reproducers for phonographs, and particularly to reproducers of that general type employing an electromagnetic pick-up unit in connection with a thermionic amplifier and a radio reproducer, i. e., loudspeaker.

Reproducers of this character as ordinarily constructed give satisfactory volume and a certain degree of clarity, but are deficient in fidelity of reproduction because they fail to respond uniformly to all frequencies within the audio frequency range.

The object of the present invention is to provide an electrical reproducing means which will reproduce all frequencies within the audio frequency range at practically equal volume, thus giving greater range and fidelity of reproduction than reproducers of the types heretofore in use.

In the accompanying drawings,—

Figure 1 is a schematic diagram of an electrical reproducer constructed in accordance with the invention.

Figure 2 is a similar view disclosing a modification.

Figure 3 is a similar view disclosing a further modification.

Referring now more particularly to the drawings, 1 designates the magnet of an electromagnetic phonographic reproducer, of which 2 is the armature, pivoted at 3 for vibratory or oscillatory motion, 4 the phonograph needle carried by the armature, and 5 and 6 electromagnetic pick-up coils. These coils are so placed that the armature 2 when in motion induces electromotive forces therein. These coils are or may be of suitable values to respectively cover the high and low frequency bands in the audio frequency range.

The coil 5 is connected to a variable resistance 7, a tuning condenser 8 and the primary 9 of the primary transformer 10 of the input circuit 11 of a thermionic amplifier 12, which may be of any suitable number of stages and of any of the types in common use. The combination of inductance and capacity in the circuit 11 is adjusted to resonance at a frequency near the lower end of the audio range. The resistance 7 is of

such a value as to broaden this resonant peak so that the potential generated across the transformer primary 9 by the vibrations of the armature 2 gradually decreases as the frequency of vibration increases. The potential across the primary 9 at the upper end of the audio range is infinitely small in comparison with the potential generated by vibration of armature 2 of equal amplitude at the lower end of the audio range.

The pick-up coil 6 is connected to the variable resistance 13, tuning coil 14 and primary 15 of the transformer 16, constituting the input circuit 17 of a second thermionic amplifier 18. The combination of inductance and capacity of this circuit 17 is adjusted to resonance at a frequency near the upper end of the audio range. The resistance 13 broadens this resonance so that the potential generated across the coil 15 by the vibrations of the armature 2 gradually decreases as the frequency of vibration decreases. The potential across coil 13 at the lower end of the audio range is infinitely small in comparison with the potential generated by vibrations of armature 2 of equal amplitude at the upper end of the audio range. The two amplifier systems are so adjusted that near the mid point of the audio frequency range the potentials generated across the transformer coils 9 and 15 are by vibrations of armature 2 of equal values.

In the organization shown in Figure 1 the amplifier circuits 12 and 18 are respectively connected at its output ends to reproducers 19 and 20 having single coil units, the coils of which are or may be responsive to the frequency ranges of the coils 5 and 6. These reproducers or loudspeakers may be of horn, cone or other suitable type, and they may be constructed to reproduce all frequencies of the audio range at nearly equal volume, or each speaker may favor the frequencies handled by the circuit with which it is connected, so that the speaker 19 will be most efficient at the lower frequencies and the speaker 20 most efficient at the higher frequencies, their conjoint action being such as to produce great fidelity of reproduction throughout the audio frequency range.

As shown in Figure 2, a single reproducer or loudspeaker 21 having a double coil unit, the coils of which are respectively connected to the output ends of the circuits 12 and 18, could be employed in place of the separate speakers 19 and 20 shown in Figure 1.

It will be seen that by providing an electromagnetic phonographic reproducer having a plurality of pick-up coils, and separate amplifying circuits for the coils, in cooperation with suitable reproducing means, which coils and circuits are designed to operate with greatest efficiency respectively in the high and low frequency bands of the audio frequency range, an accurate response of the reproducing means to all frequencies will be obtained, giving great fidelity as well as clarity and volume of reproduction and thereby overcoming the deficiencies of reproducing devices of the character heretofore in use.

As shown in Fig. 3 the primaries 9 and 15 of the preferred form of the invention have a single secondary 22 which is connected with a thermionic amplifier 23 of any suitable number of stages, the amplifier circuit then being connected at its output end with a single reproducer 24.

Having thus described our invention, we claim:—

30 An electrical reproducer for phonographs comprising an electromagnetic pick-up device having a plurality of electromagnetic pick-up coils, reproducing means having a corresponding number of energizing coils, and an
35 audio amplifier connecting each pick-up coil with an energizing coil and having its input circuit including said pick-up coil, the primary of an audio transformer, a condenser for tuning said circuit to resonance at a determined frequency in the audio frequency
40 range, and a resonance broadening resistance for varying the potentials generated in the primary coil responsive to varying amplitudes of motion of the armature of the pick-up
45 device, the said input circuits of the audio amplifiers being tuned to resonance at different frequencies in the audio range.

Signed at New York, in the county of New York and State of New York, this 26th day of
50 April, A. D. 1928.

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