May 1, 1934. F. CRUDO 1,957,158

PHONOGRAPHIC INVENTION

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Fig. 1.

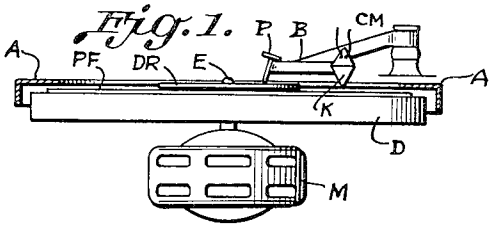


Fig. 2.

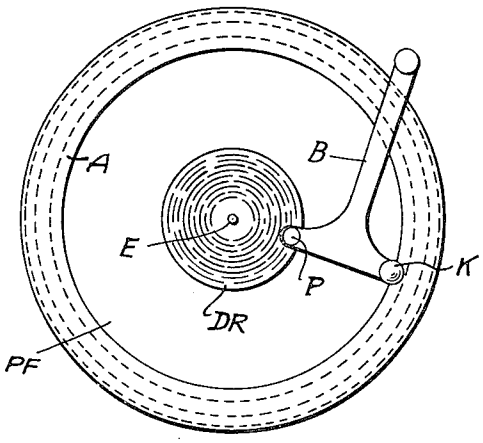


Fig. 3.

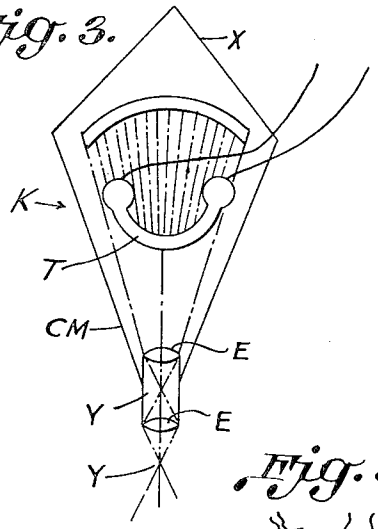


Fig. 5.

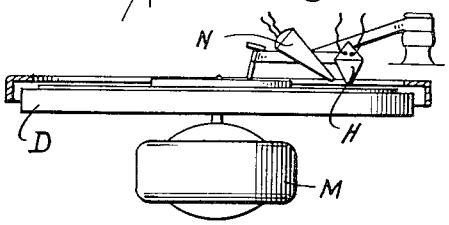


Fig. 7.

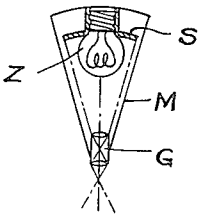
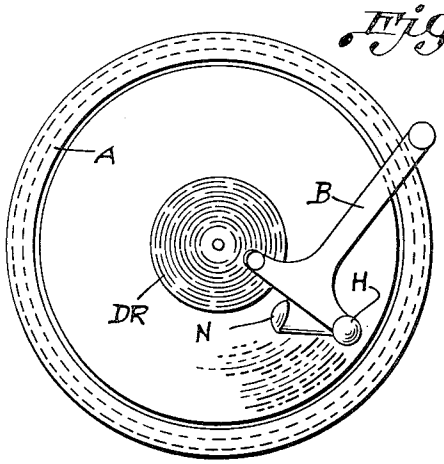


Fig. 6.



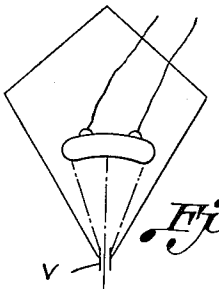


Fig. 8.

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Fig. 9.

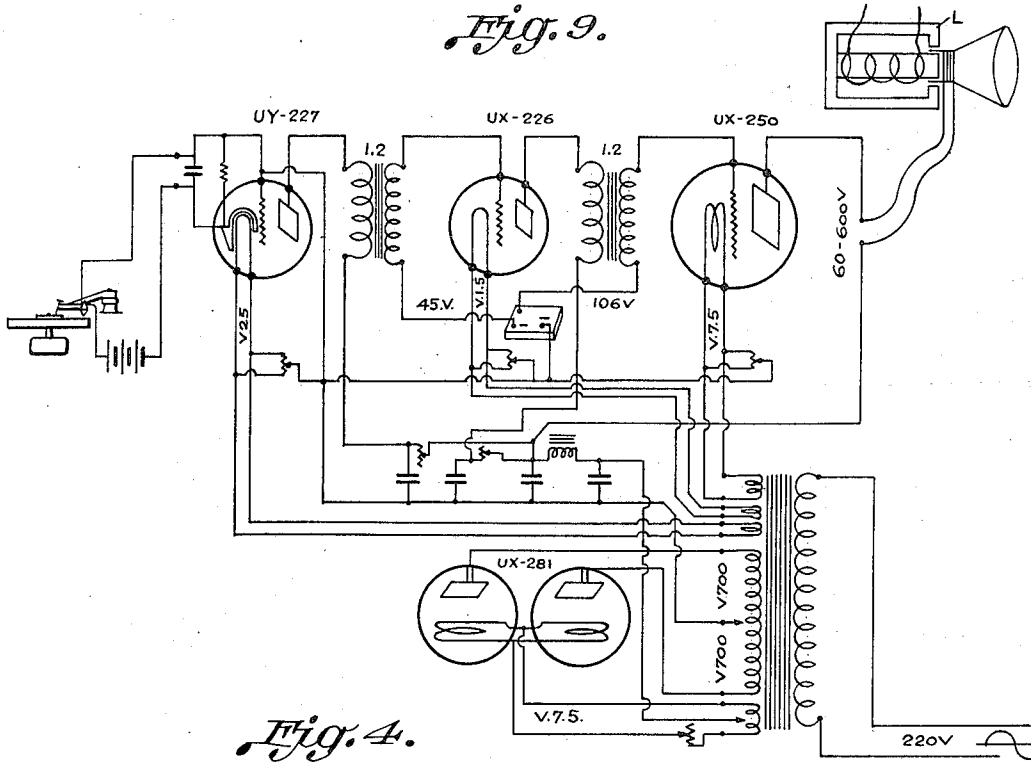
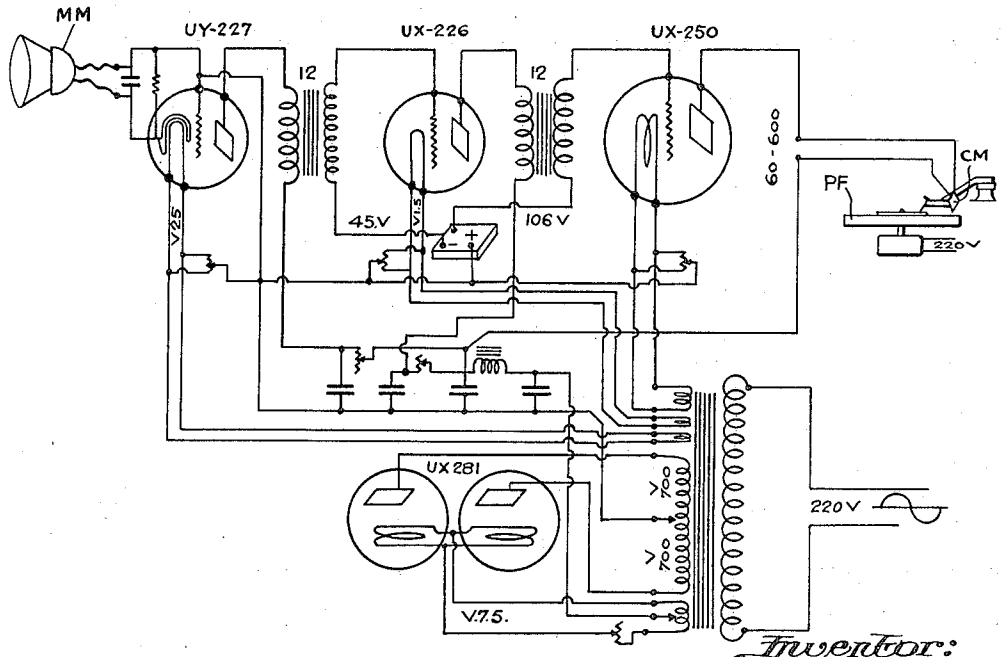


Fig. 4.



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UNITED STATES PATENT OFFICE

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PHONOGRAPHIC INVENTION

Fernando Crudo, Buenos Aires, Argentina

Application June 11, 1931, Serial No. 543,660
In Argentina February 2, 1931

3 Claims. (Cl. 179—100.3)

The present invention relates to a new phonographic invention, based on a scientific principle proved in practice, and which as ascertained with practical experiments, can satisfactorily replace the present day systems of recording and reproduction, which, since they begin from the step of engraving on cylinders, discs, and the like, are unquestionably limited in their range of utility.

The means for motivating the present invention, on the other hand, beyond all question will be successful in its operation, since it not only avoids the undesirable features of the prior art systems, but gives rise to such surprising results that they may be considered to be totally new and unexpected.

My invention is susceptible to numerous and varied practical applications since by the use of it, it is possible not only to record and reproduce all forms of sound, but also to obtain, with the same degree of definition and clarity, reproductions of documents and letters. All of these novel features are obtained with maximum efficiency and minimum expense, by means of an engraving apparatus which sets up electrical impulses which are changed into luminous vibrations, these vibrations, in turn, registering on a photographic negative with corresponding variations in intensity. When these negatives are converted into positives for controlling the reproducing apparatus, tones startling in their adherence to the original sounds are produced.

Another important and advantageous feature of my new invention is that positives can be made on any paper whatsoever, and consequently, by means of simple typographical cuts, can be reproduced in newspapers, magazines, books, stamped paper, etc., so that at any later date, these sheets can be reproduced with strict adherence to the original.

By my invention, therefore, it is possible to dictate a letter, or deliver a speech, which can later be studied by the individual to whom it is addressed, not by mere reading where much of the force and effect is lost, but by placing the record on a reproducing system, so that the actual sounds are again brought to life.

In order that the foregoing and other objects and advantages may more readily be brought to light, reference is made to the accompanying drawings, wherein:

Fig. 1 is a diametrical cut of the apparatus for impressing the negative;

Fig. 2 is a plan view of the same apparatus;

Fig. 3 is a combined side view and developed elevation of the luminous camera;

Fig. 4 depicts in schematic form the circuit associated with the machine of Fig. 1;

Fig. 5 is a sectional view of the reproducing apparatus;

Fig. 6 is a developed plan view of the apparatus of Fig. 5;

Fig. 7 is a detail of the camera adapted to illuminate means on the surface of impressed paper, so that the vibrating camera can receive the light impressions to be changed into electric oscillations;

Fig. 8 is a view of a modified camera; while

Fig. 9 is a schematic view of the circuit associated with the apparatus of Fig. 5.

The same reference numerals are employed to designate corresponding parts throughout the specification.

Referring more particularly to Fig. 1, the impressing apparatus consists of a disc or plate D, impelled in its rotating movement in clockwise direction by suitable means, such as a motor M, the disc preferably being secured directly to the shaft E of the motor. The motor is preferably adapted to impart to the spindle a peripheral speed of say, 80 revolutions per minute, in order to conveniently separate each impression in the high pitched notes.

The plate D preferably supports a photographic film PF having an especially sensitive emulsion thereon, in the order of say, 700 photograde, the edges of the film preferably being pressed against the plate by suitable means such as an annular ring A, to prevent the natural elasticity of the celluloid base of the film from causing the film to arch, which would produce deformations in the impression, resulting in mutilation of the recorded sound.

On the celluloid material and also on the shaft E, is set a disc DR, which on its upper surface has a spiral ridge of material height and a fixed pitch, which acts as a guide to cause an interchangeable needle P of steel or other suitable metal, to move towards the center. In the preferred form of my invention this needle P is fitted on one extremity of an arm B, which is also adapted to hold the camera K. This latter is adapted to convert into luminous vibrations of varying intensity, the electric pulsations impressed thereon by the amplifier shown in Fig. 4, which imparts a variable potential difference of from approximately 60 to 600 volts, at a maximum intensity of 55 milliamperes.

The camera, shown in greater detail in Fig. 3, preferably consists of a hollow metallic cone CM, the vertex of which has an objective O in which

are mounted two lenses E', E' destined to focus into a point Y the luminous rays emitted by a curved glass tube T, having its convex face turned towards the lenses E', E'. The tube T preferably contains rarefied neon gas which emits, when properly energized, an actinic light proportional in intensity to the energizing current, this actinic radiation being reflected by suitable means such as a reflector X, which may be of polished metal, which concentrates it on the objective, in carrying out the aforesaid process.

The vibrations, whatever may be their source, are collected in the microphone MM (Fig. 4) and are then amplified in any desired amount, say 200,000 times, by means of the amplifying circuit which may be of any conventional design. Since the details of such amplifying circuits are well known, it is believed to be unnecessary to describe any particular form in detail, in this application.

It is sufficient that the amplification be great enough to energize the gas contents of the tube T, whereupon the rays are concentrated in previously described manner on the lenses E', E', in the rear of which is placed the film, the lenses having a field of say 1 mm. by 0.5 mm. As shown in Fig. 3 at K, the cell is passed over the film in a revolving, spiral movement, corresponding to the movement imparted to the needle P and arm B by the disc DR.

The film thus has impresed thereon, in a spiral path, a plurality of wave forms of varying dimensions and intensity depending upon the output of the amplifier. Following the exposure of the film, it is contemplated that it be developed and fixed in known manner, after which by means such as a lithographic process, it would be reproduced on paper or the like, for audible reproduction at any desired time.

The reproduction means, shown in Fig. 5, is quite similar to the impression apparatus, differing therefrom in that by the side of the photoelectric camera is placed another camera having means for constantly emitting a continuous beam of light, adapted to illuminate the surface of the positive or copy in the gate in front of the small window of the photoelectric camera. This latter of course contains on its interior the photoelectric cell, the operation of the system being substantially as follows:

The illuminating camera N, Fig. 7, has on its interior a hollow mirror or reflector S, a lamp disposed in front thereof, and preferably having a candle power of approximately 100, and a concentrator G for converging the light pencils into a beam of about 7 mm. diameter under the small window of the photoelectric camera H, Fig. 5, this opening being extremely small.

When a white line of the engraving on the positive copy is passed across this last-mentioned window, a bundle of luminous rays passes into the camera, the intensity and duration of which rays is proportional to the graduation and length of the impression, and thus to the intensity and tone of the registered sounds. Upon the incidence of this radiation on the cathode of the cell, a current flows therethrough, and since this cell is connected in the amplifying circuit of Fig. 9, the luminous waves are converted into proportional electrical impulses, which after suitable amplification at audio-frequency are impressed on and reproduced through the loud speaker L, shown as being of the electro-dynamic type.

It is of course obvious that once my invention has been disclosed it is subject to numerous modifications and adaptations, as a consequence of which it is intended that it be limited only by the scope of the appended claims.

I claim:

1. Photographic reproducing apparatus, comprising a lamp, a needle adapted to move said lamp along a fixed path, a source of variable sound, means for varying the light emission of the lamp in accordance with the variations of the sound, and a film over which the lamp is passed, and on which is received an impression of the variable sound.

2. Photographic reproduction apparatus, comprising a lamp, a needle for moving said lamp along a fixed path, a rotatable guide for guiding the said needle during its movement, a source of variable sound, means for varying the light emission of the lamp in accordance with the variations of the sound, and a film over which the lamp is passed and on which is impressed the variations of sound.

3. Photographic reproduction apparatus, comprising a source of variable sound, a circuit for amplifying said sound, a luminous gas-filled, space discharge tube on which the amplified sound is impressed, the light emission of the tube thus varying in accordance with the variations of the amplified sound, a needle and rotatable guide for moving said tube along a fixed path, a photographic film over which the tube is passed and which receives an impression of the variable light emission, a photoelectric cell for scanning a positive made from the exposed film, a needle and rotatable guide for guiding said cell in its passage over said positive, a detecting and amplifying circuit connected with said photoelectric cell, and a loud speaker for reproducing the electric variations of said cell.

FERNANDO CRUDO.