Aug. 31, 1926. 1,597,726

E. E. F. D'ALBE

APPARATUS FOR RECORDING AND REPRODUCING SOUND

Filed Feb. 10, 1926

FIG. 1

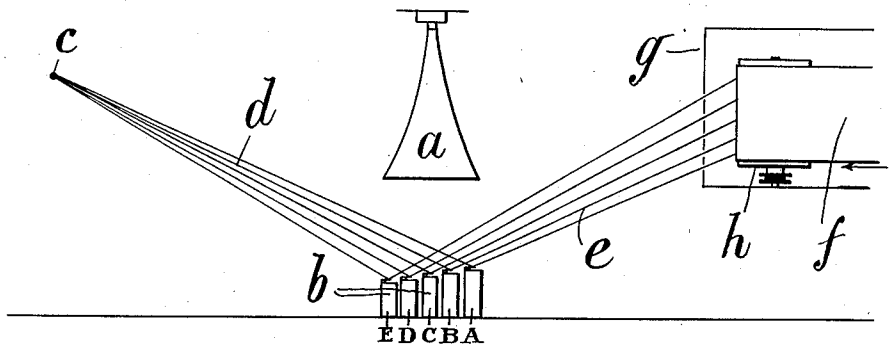


FIG. 2

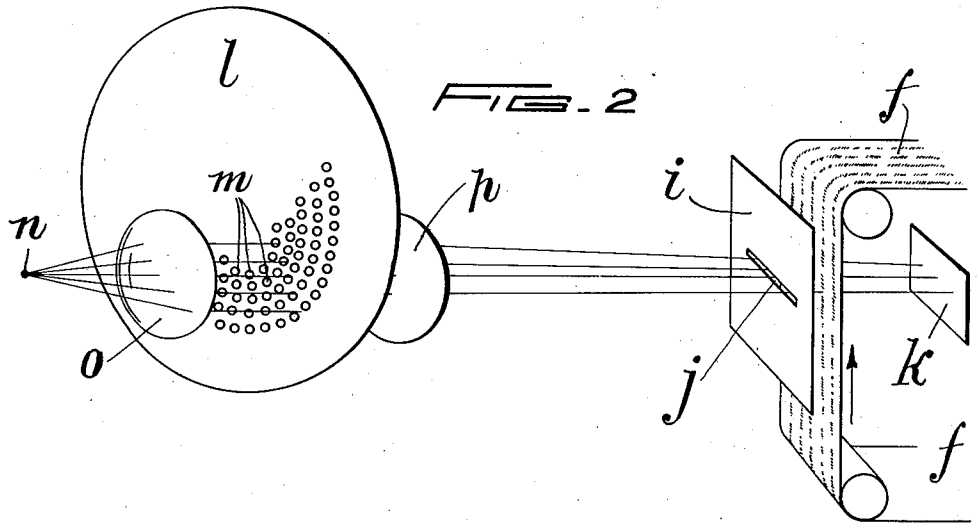


FIG. 3

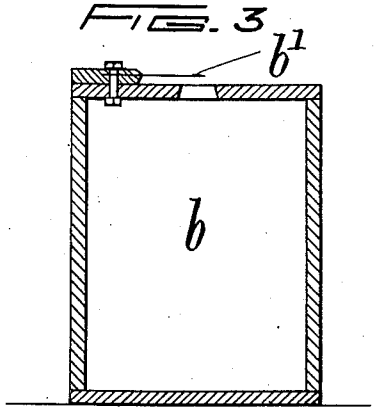
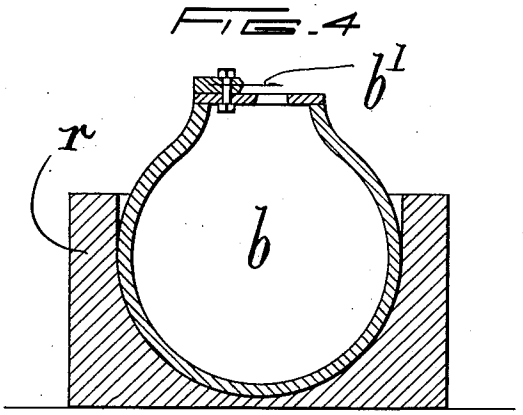


FIG. 4



Inventor-
E. E. F. d'Albe
By Jno. Guerin
Atty

Patented Aug. 31, 1926. 1,597,726

UNITED STATES PATENT OFFICE.

EDMUND EDWARD FOURNIER D'ALBE, OF FINCHLEY, LONDON, ENGLAND, ASSIGNOR OF ONE-HALF TO ADAM HILGER LIMITED, OF LONDON, ENGLAND, A BRITISH COMPANY.

APPARATUS FOR RECORDING AND REPRODUCING SOUND.

Application filed February 10, 1926, Serial No. 87,373, and in Great Britain October 23, 1924.

This invention relates to an apparatus whereby sound can be permanently recorded and reproduced at will.

When recording sound according to my invention individual sound waves of a medley of sound waves are made to cause a corresponding number of pencils of light to vibrate for a duration of time equal to the duration of the sound wave. The distinctive feature of the invention is that I select these light vibrations from the medley by employing hollow resonating vessels each of which responds to one musical note and is provided with a reed tuned to the same or fundamental note of the hollow vessel to which it is attached.

Light-reflecting reeds or diaphragms are known in connection with sound recording apparatus, but as far as I am aware the above arrangement forms a novel combination for use with such apparatus.

I have found that by employing these hollow resonating vessels, each reed is confined to its own natural period of vibration. This combination greatly increases the response of the reed to the incident frequency, and at the same time prevents response to frequencies differing from the fundamental frequency of the combination, since the reed and the hollow vessel do not have the same natural overtones. A high selectivity is thus secured which lies within the range of one half of a semitone or less in the higher octaves.

The reed is attached to the vessel by one end and its other or free end is disposed over an opening in the vessel and has a mirror or equivalent reflecting surface. The pencils of light reflected by the mirrors are each projected so as to just completely pass through an allotted perforation or through one of a row of transparent portions made in or on an opaque screen. Close behind this screen a photographic film is moved in a direction parallel to the plane of the screen and perpendicular to the row of transparent portions. During silence the light will be reflected by the reeds through the transparent portions of the screen and the film exposed along a number of parallel lines corresponding to the number of resonating vessels with reflectors.

Upon sound being received or analyzed by some or all of these resonating vessels, hereinafter called resonators, the reeds will be set into sympathetic vibration and their pencils of light will be thrown on to the opaque screen and to a less extent through the transparent portions according to the intensity and duration of the sound. By this means a photographic record will be produced in the form of parallel lines, each line representing an individual musical note and varying in intensity according to the vibration and duration of its exposing light.

To reproduce sound according to the invention I break up light from a suitable source into individual light pencils, each being constituted by a succession of flashes having an intermittency per second equal to the frequency of vibration per second of an individual musical note, and I so arrange the record produced as above described in relation to these pencils of light that each parallel line of the said record, representing an individual musical note, controls, because of its varying transparency, the proportion in which a pencil of light representing an identical musical note, passes to a selenium cell or cells connected in substantially known manner with a telephone or the like.

The light breaking up means may be of the type in which a disc is rotated and consists of concentric circles, each divided into different numbers of opaque and transparent portions so that when a streak of light is projected on to one side of this disc along a radial line the light emitted at the other side will be in the form of a row of pencils of light, each pencil constituted by a succession of flashes from the illuminated transparent portions of the concentric circles and each having a different intermittency corresponding to the frequency of vibration of an individual musical note.

The sound reproduction in accordance with the invention may be carried into practice as follows:—

Each pencil of intermittent light representing an individual musical note is arranged to strike a parallel line of the record representing an identical note. When the record which is arranged parallel to the plane of the light breaking up disc is moved perpendicularly to the row of intermittent

light pencils and at the same speed as that at which it was made, the unexposed or broken parallel lines will allow of their assigned pencils of light each of different intermittency to pass to the selenium cell and thus the cell will be activated at the individual intermittency of each pencil of light, i. e. if the notes C, G were simultaneously recorded the two parallel lines representing C, G respectively would be partly unexposed and therefore partly transparent and allow two pencils of light also respectively representing C, G to activate the selenium cell at the intermittency of these light pencils. Thus the telephone or the like with which the cell is in electrical connection would simultaneously sound the notes C, G according to the duration of the unexposed lines.

If desired, the record could be interposed between the light source and light breaking up means, in which case each parallel line representing an individual musical note must register with the illuminated part of the circle on the light breaking up device which represents an identical musical note. Thus the light passed by each line of the record will be broken up into intermittent pencils of light, each having an intermittency corresponding to the frequency of vibration of the musical note represented by its line and when projected on to the selenium cell will activate it and operate the telephone as described in the preceding paragraph.

I will now describe my invention with refernce to the accompanying drawing in which:

Fig. 1 is a diagrammativ view of the recording apparatus with five resonators.

Fig. 2 is a diagrammatic view of the apparatus for reproducing.

Figs. 3 and 4 show two forms of resonators.

In Fig. 1 it will be assumed that sound emanates from the trumpet *a* and is directed on to the five resonators *b* having silvered reeds tuned to say, notes A B C D and E respectively.

A source of light is provided at *c* and its rays are directed on to the reeds of the resonators as indicated by lines *d* and are reflected as lines *e* from the reeds to a light sensitive film *f* arranged behind a perforated screen *g*.

The film *f* rotates on drum *h* and as the light pencil strikes the film exposure lines are produced on it.

When a reed is vibrated by a note its pencil of light *e* is broadened out and strikes the screen and has little or no effect on the film.

After the exposed film is prepared it is introduced to the reproducer seen in Fig. 2. In this drawing the film *f* is arranged between a screen *i* having a slot *j* and a selenium cell *k*. In front of the screen is a light-breaking up device comprising an opaque disc *l* having perforations *m* concentrically arranged. A source of light *n* is caused to throw its rays on to a lens *o* from which they are redirected in parallel manner on to the perforated screen and pass through the perforations as the screen is rotated. All the rays passing through the screen are projected by a second lens *p* and thrown forwardly on to the screen *i*. The slot *j* permits only the preselected rays, each corresponding to a different musical note, to pass on to the film *f* and through the transparencies in it to the cell which is correspondingly activated.

In Fig. 3 the resonator *b* is shown of rectangular shape and has a reed *b'*, whilst in Fig. 4 the resonator is spherical and placed in a carrier *r* in which it can be set at any desired angle.

The screen *g* may be dispensed with, in which case the line on the negative is widened when the light pencil *e* vibrates.

What I claim is—

1. In an apparatus for photographically recording the constituent frequencies of sound, a record sheet sensitive to light rays, a screen arranged in front of the record sheet, said screen having a series of transparent portions, a light source, a series of resonators respectively responsive to separate musical notes, a light reflecting reed carried by each resonator and tuned to the resonator note and adapted to reflect light rays from the light source to the respective transparent portions of the screen, and thus effect the record, the respective notes of the sound to be recorded affecting the particular light rays through the responsiveness of the particular resonator to vary the effect of the light ray on the record through the screen.

2. An apparatus for photographically recording the constituent frequencies of sound consisting in a photographic record sensitive to light rays, means for reflecting light rays from the source of light toward the record, a screen interposed between the reflecting means and the record and formed to direct the light rays on to the record in a series of parallel lines and resonators each responsive to a musical note and operating to vary the effect of the particular light ray on the record through the screen to vary the intensity of the light effect in the respective parallel lines of the record.

3. An apparatus for photographically recording the constituent frequencies of sound consisting in a photographic record sensitive to light rays, means for reflecting light rays from the source of light toward the record, a screen interposed between the reflecting means and the record and formed

to direct the light rays on to the record in a series of parallel lines and resonators each responsive to a musical note and operating to vary the effect of a particular light ray on the record through the screen to vary the intensity of the light effect in the respective parallel lines of the record, and means for reproducing sound from such record with the reproduction controlled by the intensity of light permitted to pass through the exposed lines of the record.

In testimony whereof I have affixed my signature.

EDMUND EDWARD FOURNIER d'ALBE.