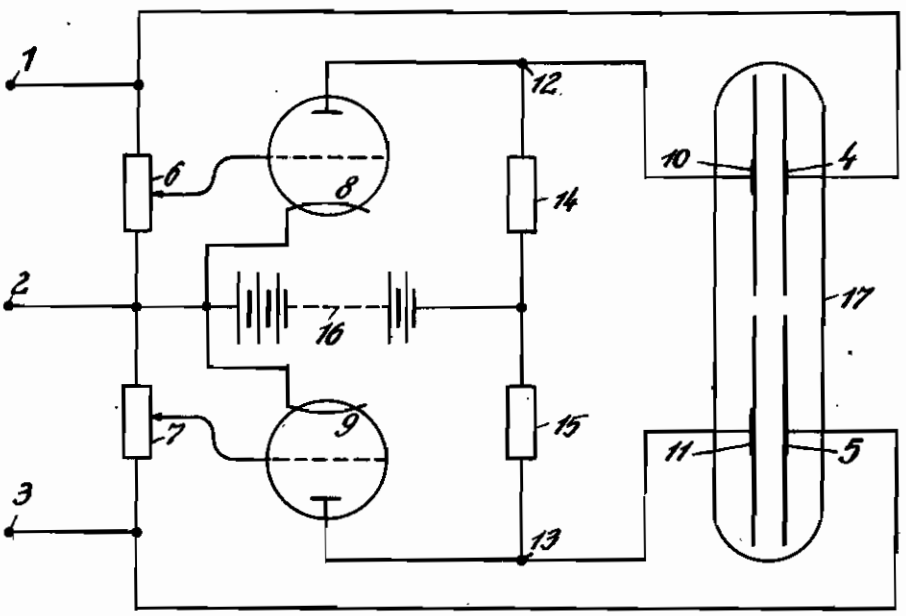
PUBLISHED
MAY 18, 1943.
BY A. P. C.

C. BECKER
LEVELING THE CHARACTERISTIC OF PHOTOGRAPHIC EMULSIONS
Filed Aug. 23, 1940

Serial No.
353,974




*Inventor:*
Carlheinz Becker
By: Stevens and Davis
ATTY'S.

Published May 18, 1943 Serial No. 353,974

# ALIEN PROPERTY CUSTODIAN

## LEVELING THE CHARACTERISTIC OF PHOTOGRAPHIC EMULSIONS

Carlheinz Becker, Berlin-Wilmersdorf, Germany; vested in the Alien Property Custodian

Application filed August 23, 1940

When taking sound records in half-wave-intensity records (push-pull-class B records) in which, as is well known, the working point lies at the lower end of the photographic characteristic, the obtainable resting transparency is limited by the downward curvature of the photographic characteristic and, therefore, for the purpose of obtaining a sufficiently large reduction of the interference or noise level, renders necessary the use of the push-pull-class AB or the push-pull-class A method in which the resting transparency lies above the curvature of the photographic characteristic. Hitherto in making half-wave-intensity records, using the so-called sag as well as the so-called straight or direct method, resting transparencies were obtained which at the best amounted to about a fifth to an eighth of the maximum resting transparency. Due to the gradation determined by the image, the photographic starting characteristic of the positive cannot be influenced. With the use of photographic means the photographic starting slope of the negative cannot substantially be increased beyond the hitherto obtainable degree. To ensure the reduction of the interference or noise level and the volume of sound of the half-wave-transverse records, it would be necessary to realize an infinite or even a negative slope of the starting characteristic in the negative.

According to the present invention a practically linear transfer characteristic with a resting transparency of any desired magnitude and with any desired reduction of the interference or noise level is obtained for half-wave-intensity records by using for making records a divided Kerr-cell having two pairs of plates and supplying an additional voltage, depending on the amplitude, to each of the pairs of plates besides the resting voltage and the corresponding half-wave voltage. This additional voltage decreases in proportion to the increase of the amplitude of the half-wave voltage. The additional voltage is so chosen that the product of the slope of the characteristic of the electric transfer device and the photographic blackening characteristic has a constant value for each amplitude.

In this manner, for instance, a sound record according to the Kerr-cell method is made in such a manner that an ordinary Kerr-cell is divided and each of the pairs of plates of the double Kerr-cell is supplied with the resting voltage as well as the corresponding half-wave voltage and, moreover, during operation on the non-linear portion of the photographic Kerr-cell characteristic, is supplied with an additional voltage which in proportion to the voltage applied is the larger the smaller the slope of the photographic characteristic is.

An additional voltage satisfying this requirement is produced according to a further feature of the invention by supplying a portion of the half-wave voltages applied to the pairs of plates to the control grids of an electron tube having an exponential characteristic and by adding to the two half-wave voltages the voltages, occurring at the anode resistances.

Preferably the control circuits of the two Kerr-cells are so formed that the source of the half-wave voltage, serving simultaneously for controlling the exponential tube, the anode voltage, serving as resting voltage for the Kerr-cells, and the anode resistances are connected in series with a pair of plates of the double Kerr-cell.

In the accompanying drawing one arrangement according to the present invention is diagrammatically shown by way of example.

The two half-wave voltages derived from a rectifier are applied to the resistances 6 and 7 between the points 1 and 2 and 2 and 3 respectively. The resistances 6 and 7 respectively are connected in series with the resting voltage 16 of the Kerr-cell, the resistances 14 and 15 at which the additional voltages are produced, and the pairs of plates 10, 4 and 11, 5 of the Kerr-cell 17 which electrically are independent on each other. A portion of the half-wave voltages applied to the resistances 6 and 7 respectively is supplied to the control grid of exponential tubes 8 and 9 respectively. The resting voltage 16 of the Kerr-cell simultaneously serves as anode voltage for the push-pull-connected tubes 8 and 9. The resistances 14 and 15 respectively, arranged in the control circuits of the two pairs of plates of the Kerr-cell, form the anode resistances of the two tubes 8 and 9. The voltages occurring at the anode resistances 14 and 15 are added to the voltages applied to the resistances 6 and 7 and form the additional voltages necessary for compensating the curvature of the photographic starting characteristic if the plates 10 and 11 of the Kerr-cell 17 are connected to the points 12 and 13 respectively.

The half-wave voltages must be so connected to the resistances 6 and 7 that the negative poles lie at the points 1 and 3. Each half-wave then produces a negative voltage impulse at the control grid of the corresponding exponential tube. Due to the logarithmic course of the tube characteristic the anode current is not proportional to the half-wave amplitude applied to the control

grid, but on an increase of the half-wave amplitude the increase of the anode current becomes smaller and smaller. Starting from a certain half-wave amplitude the anode current no longer increases so that the additional voltage cannot exceed a certain highest value. In other words this means that with an increasing amplitude of the half-wave voltage the additional voltage decreases in proportion to this increasing amplitude.

For carrying out the above described method a Kerr-cell having four electrically independent plates is required. Empirically the exact and reliable manufacture of such Kerr-cells having four individual plates is very difficult.

When making records considerable difficulties are encountered by the fact that the plates of the usual Kerr-cells tend to vibrate under the influence of the electric alternating fields, whereby the production of a record free of objections is prevented. It is necessary that the two electrodes always are arranged in exactly the same plane and are spaced from each other in exactly equal distances. Moreover, the gaps formed by the electrodes must be absolutely parallel. These requirements, however, cannot be fulfilled with the hitherto known kind of electrodes. With the known electrodes, consisting of metal plates and metal blocks, the required precision cannot be obtained.

According to a further feature of the present invention, the Kerr-cell for carrying out the above described method is so constructed that the two pairs of electrodes are formed of two glass- and porcelain plates ground in plane parallel which are separated from each other by insulating distance pieces arranged in plane parallel fashion the surfaces of which facing each other are, by known methods, provided with thin metal layers which in the middle of the plates are separated from each other in the form of a narrow line.

Practically the electrodes of the Kerr-cells are made in such a manner, that two long, rectangular glass- and porcelain plates ground in plane parallel are provided, by methods known per se, for instance by cathode atomising, galvanisation etc. each on one side with a thin metal layer. In the middle of the plates these metal layers are then removed in a narrow line in parallel to the shorter edge of the plate so that two metal layers, electrically separated from each other, are arranged side by side upon each plate which form the electrodes of the Kerr-cells. The two plates then are mounted in the Kerr-cell with the metal layers facing each other and maintained in the proper distance from each other by plane parallel insulating distance pieces.

Such double Kerr-cells have the advantage that the plates of the two pairs of plates positively have equal distance from each other so that in electrical respect the two pairs of plates are equivalent with an exactness as great as possible. A further advantage is the large mechanical strength of the plates so that movement of same during operation is impossible.

CARLHEINZ BECKER.