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METHOD OF PICTURE TRANSMISSION

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Fig. 1

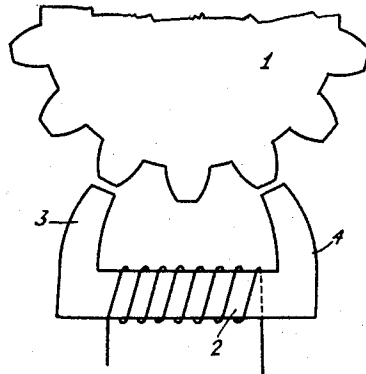


Fig. 2

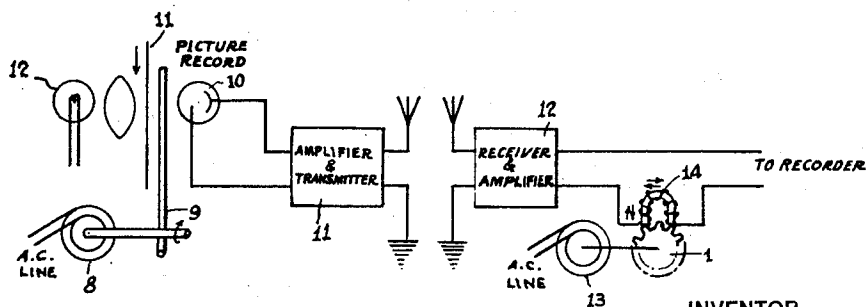
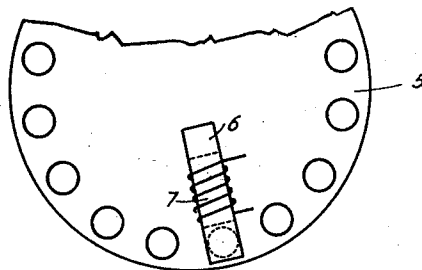


Fig. 3.

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METHOD OF PICTURE TRANSMISSION

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In some methods of modulating a carrier wave with picture currents, for instance, when the carrier frequency is produced by chopping the light at the sending end, say, by the aid of a revolving perforated disk, current impulses reach the line whenever the scanning pencil of light happens to impinge upon a bright spot on the picture. Now, if the receiver is so designed that blackening of the incoming or re-created picture occurs when current comes in, while no blackening happens in the absence of current, then, as will be seen, a negative picture is re-created. This case, for example, will arise when the modulated oscillations come to act upon a Kerr cell or else when the recording is accomplished by electromagnetic means and ways.

In order to obtain a positive picture, various methods have been disclosed in the prior art. For instance, it has been suggested to utilize a second photoelectric cell upon which comes to act chopped-up light, but no light modulated by the picture to be transmitted. By taking care so that the currents of the two photoelectric cells, i. e., the picture cell and the compensator cell, will come to co-act in a suitable manner, for instance, by providing a bridge arrangement, not only can the picture be reversed or transposed, but such an arrangement is further adapted to regulate the degree of modulation both in sending positive as well as negative pictures. This is not only desirable in frequent instances, but even imperative, if the incoming and re-created pictures are to be made perfect.

But this method involves several shortcomings. In the first place the use of two cells instead of merely one cell is expensive and not convenient in practical operation owing to the limited life and the absence of constancy in the properties of the cell. The circuit elements at the input end of an amplifier possessing high amplification, which are required on changing from positive to negative transmissions, are apt to conduce to difficulties, such as increased capacitance, tendency to oscillate, reception and picking up of stray currents. Furthermore, with the method stated, reversal is feasible only in the transmitter, while it may also be desirable to effect such reversal in the receiver apparatus. For instance, if a plurality of transmitters alternately work upon a receiver, then the reversing means need to be provided just once in the entire system, if they are built into the receiver.

The method here disclosed is intended to obviate these difficulties. It consists in combining at the proper phase relation and the correct amplitude the carrier currents modulated by the picture currents with currents of like frequency generated by a small a. c. dynamo or the like, such as a tone-wheel or sirene. The phase can be so adjusted in this scheme that the currents corresponding to white surfaces or spots are wholly or partly compensated for positive pictures or else so that their amplitudes are augmented by cooperation with the acoustic wheel for negative pictures. What is presupposed is that the added currents and the carrier currents have constantly and permanently the same frequency, an aim which is attained in the perforated-disk method by driving the perforated disk and the tone-wheel by one and the same motor, most preferably by seating them upon the same spindle. If the currents are combined in the receiver, then the tone-wheel must be driven from a motor running in synchronism with the sending-outfit motor, for example, the motor driving the cylinder of the incoming picture. Adjustment of the correct phase relations may be effected by turning the stator of the tone-wheel, or else by shifting the optical means parallel to the circumference of the perforated disk. Another chance to adjust conditions consists in displacing the rotor of the tone-wheel or else the perforated disk angularly upon the respective spindle.

The arrangement can be made particularly simple if the perforated or serrated disk is made of iron, and if the teeth which periodically mask the light are at the same time used for the generation of the alternating current magnetic flux. This form of construction offers this advantage that, upon exchanging the perforated disks, e. g., for changing over to another carrier frequency, not only the fre-

quency of the compensating current will automatically be made equal to the carrier frequency, but that also the phase relations are preserved. It is also easily possible in this
 5 scheme to make the wave shapes of the two cooperating currents identical in that the cross-sectional shape of the magnetic flux is adapted to the cross-section of the pencil of light rays.

10 Regulation of the desired amplitude conditions can be accomplished by regulation of the filament current, by the use of variable resistances or attenuating means, or by regulation of the exciting current used for the tone-
 15 wheel. It may be recommendable in this connection, in addition to adjustability of the amplitudes of both currents, to provide a certain interrelationship, say, between the exciting current and the tube (lamp) current in
 20 such a manner that, when the picture currents become smaller owing to decrease of the lamp current, also the current of the tone wheel becomes simultaneously smaller so that the degree of modulation or compensation is preserved.
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Since, generally speaking, the curve-shape of both currents will be different, it is recommendable to insert in the long distance line or in the wires brought to the radio transmitter, an electric filter for smoothing,
 30 for instance, a coil low-pass filter.

The combination of the two currents may be effected at different places. The tone-wheel should be as small as feasible in order
 35 to save expense. Hence, if a relatively large output power is required, for instance, in radio or air-line operation, such combination most suitably is to be effected between two tubes of the amplifier, while in the case
 40 of low output powers such as needed in telegraph work, it is most suitably effected at the output end of the transmitting amplifier. If the tone-wheel is mounted at the receiving end, the currents most conveniently are combined at the input end of the amplifier.
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The accompanying drawing illustrates several modifications of the device above described wherein:

Fig. 1 illustrates one form of alternator;
 50 Fig. 2 illustrates a modification; and Fig. 3 illustrates a system for producing the reversing action at the receiver in combination with the arrangement shown by either Fig. 1 or Fig. 2.

55 The construction of the alternator may be chosen the same as that of any ordinary alternating current machine. In order to save cost it will be found desirable to have recourse to the well-known sirene type of alternator (Fig. 1) in which the rotor 1 has no winding, while the stator 2 consists of a simple magnetic yoke comprising two poles 3 and 4.

Another embodiment is shown in Fig. 2.
 65 In this case the perforated disk 5, preferably

made of iron, required for the optical analyzing, is used at the same time for the generation of the alternating magnetic flux. The generated current is taken from winding 7 surrounding the magnetic core 6 which
 70 is disposed in radial direction in front of the perforated disk.

In place of the perforated disk a serrated disk may also be used as in the embodiment according to Fig. 1. The teeth mask the light
 75 periodically, thereby effecting the optical analyzing.

By Fig. 3 a complete system is shown wherein at the transmission point a synchronous motor or the like 8 is driven from an a. c. line and arranged to rotate the chopping disk 9 which is placed immediately in front of the photo tube 10. The picture record 11 is illuminated from a light source 12 and the light signals brought to act upon the photo cell 10 are periodically interrupted by means of the rotary disk 9. The amplitude modulated signals, modulated in accordance with the tonal density of the picture record, are amplified and transmitted by the amplifier and transmitter 11 and then received at the receiving point by the receiving and amplifying device 12 from which they are transferred to a recorder system, not shown. Similarly to the point of transmission, the receiver recording device is driven by means of a synchronous motor 13 which can, if desired, be connected to the same a. c. supply line. As the motor 13 is rotated, it drives a generator 1, for example, of the type shown by Fig. 1, and by suitable arrangement of the pick-up device generally designated as 14, the amplitude and phase of the locally generated signals may be determined. The phase is determined by shifting the pick-up device to the right or left as shown, and the amplitude may be controlled by moving the pick-up device radially inward or outward from the tone generator.
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Having now described my invention, what I claim and desire to secure by Letters Patent is the following:

1. The method of producing picture reversal and regulating the modulation in picture telegraph apparatus which comprises generating carrier currents and modulating said currents by currents representing the varying intensities of light and shadow of the picture elements of the transmitted record, simultaneously generating at the receiving point other currents of the same frequency as the carrier current generated, and adding the two generated currents in predetermined phase relationship so as to produce either positive or negative picture reproduction at the receiving point.
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2. The method of producing picture reversal in picture telegraph apparatus which comprises generating a carrier frequency, modulating the carrier frequency by signal
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impulses corresponding to the varying intensities of light and shadow of the picture elements, generating at a receiving point a second frequency corresponding to that of the carrier frequency, and regulating both
5 currents in size and in phase so as to selectively create at the receiving point positive or negative pictures and control the picture modulation.

10 In testimony whereof I affix my signature.
FRANZ TUCZEK.

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