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TELAUTOGRAPH

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Serial No.
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Fig. 1.

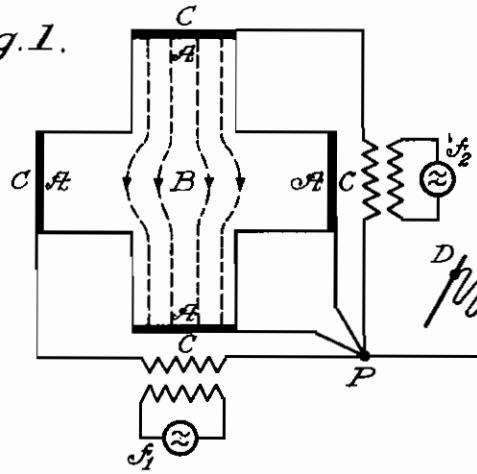


Fig. 6.

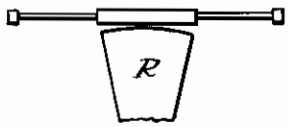
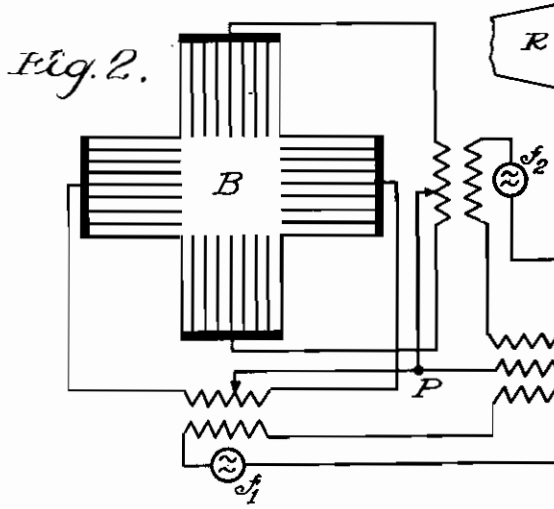


Fig. 2.



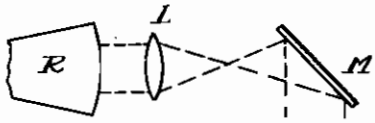
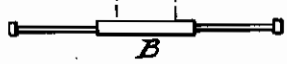


Fig. 5.



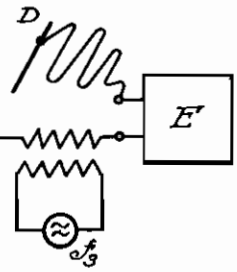


Fig. 3.

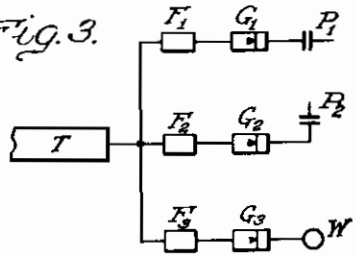
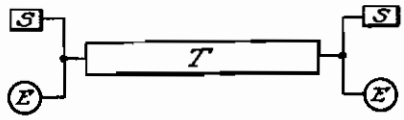


Fig. 4.



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ALIEN PROPERTY CUSTODIAN

TELAUTOGRAPH

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Application filed October 23, 1940

The present invention relates to an electric telautograph, by means of which, for instance, a drawing made by hand at a transmitting station is rendered visible substantially at the same time at the receiving station. In this case the remote transmission may be effected either by the wireless method or over lines. The present invention is particularly suitable in reproducing at the same time in the receiving apparatus the text written at the transmitting apparatus.

A known method for facsimile transmission of images with the aid of a cathode ray tube consists in scanning line by line the drawing or the text (television). It is true that in this case the advantage is presented that the images or text may practically be reproduced when transmitting the same. However, this method has the drawback that a very wide frequency band determined by the number of image points per unit of area is necessary for the remote transmission. To avoid this drawback the electron ray is guided according to another known method by suitable deflecting devices in the same manner as the stylus of the transmitter. The text written is reproduced on a photographic plate (telautograph). Although the advantage of a narrow frequency band is thereby obtained, the last-mentioned method presents nevertheless the drawback in that the drawing to be transmitted is only visible when developed by the photographic method.

According to the known telewriting method the coordinates are either represented by resistances and potentiometers which are mechanically controlled by the stylus or the change in resistance between the stylus and the fixed points is utilized on the writing plate consisting of resistance material to characterize the coordinates. The first method has the disadvantage that the stylus is prevented from being moved by the mechanical parts cooperating therewith, whereas the second method encounters difficulties as to the linearity of the transmission and as to the fact that resistance values cannot be directly transmitted over great distances.

The present invention combines the advantages of the abovementioned methods and avoids the disadvantages thereof. This may be accomplished by the fact that the electron ray of a cathode ray tube for reproducing pictures is controlled in accordance with the movements of the stylus of the transmitter and that each image point is visible on the fluorescent screen during the time necessary for writing the text, i. e., for instance, for 15 seconds to 2 minutes.

The arrangement according to the invention may preferably be designed in the manner that an extinction or ignition of the electron ray corresponds to a removal of the stylus from the writing plate or to a placing of the same thereon.

The electron ray cooperates with the stylus in such a manner that the position of the stylus on the writing plate is characterized by two potentials which are a measure for the coordinates of the point where the stylus is placed on the plate. These two coordinate potentials are represented by alternating voltages of different frequency. They serve to deflect the ray in both coordinate directions. In this manner a position of the luminous point on the fluorescent screen corresponds to the position of the stylus on the writing plate. The frequency band necessary for the transmission is not determined by subdividing the image but only by the speed with which the text is written and is accordingly very narrow (about 5 to 10 cycles/sec. as compared to more than 10^6 cycles/sec. as is the case with known telewriting methods).

Further details of the invention will be apparent from the description taken in connection with the accompanying drawings, in which

Fig. 1 shows the construction of the transmitting apparatus.

Fig. 2 shows a modified construction of the transmitting apparatus.

Fig. 3 shows the receiving apparatus in diagrammatic form.

Fig. 4 shows a schematical representation of the arrangement with two transmitting and two receiving apparatus.

According to the invention two homogeneous fluxes crossing each other and having the frequencies $f1$ and $f2$ are produced according to the invention on a conducting or semi-conducting writing plate. Each point may then be characterized by two potentials with these frequencies. Rectangular coordinate systems or also a curvilinear coordinate system may be employed. In the case of rectangular coordinate systems x and y, the amplitudes of the two alternating voltages which are tapped off by the stylus when placing it on the writing plate are linearly dependent upon x and y, i. e.,

$$U1 = a_0 + a_1 x \text{ with the frequency } f_1$$
$$U2 = b_0 + b_1 y \text{ with the frequency } f_2$$

These alternating voltages vary when writing the text in accordance with time with varying x and y. They are supplied to the transmission system, for instance, to a telephone line or to a radio channel.

The linearity between the voltages U1 and U2 and the coordinates x and y expressed by the two equations presupposes that the flow of current in the writing plate be homogeneous. This is accomplished according to the invention by designing the current leads in the form of extensions of the writing plate so that in the case of rectangular coordinates the cross-shaped type shown in Fig. 1 is obtained. The arms A serve to

connect the poles of the alternating-current sources through the highly conducting bridging members; B is the writing plate proper. If the arms A were short the two fluxes would become very distorted by the adjacent bridging members C, since these bridging members would absorb a great portion of the lines of flow of current as a result of their high conductivity. This disturbing effect disappears the sooner the longer the arms are made; but even in the case of very long arms A there would remain a residual distortion, since the lines of flow of current of the field enter the arms of the other field. The lines of flow of current running in the direction as indicated by the arrows enter, for instance, the horizontal arms as indicated by the dash lines shown in Fig. 1. According to the invention the arms serving as current leads are besides slotted in the longitudinal direction so as to increase the reactance of the arms to a considerable extent and the lines of flow of current are prevented from entering the horizontal arms (cf. Fig. 2). Even in the case of comparatively short arms, i. e., in the case of a relatively compact arrangement, the longitudinal slots bring about an approximately homogeneous flux.

In the arrangement shown in Fig. 1, the two energy sources are connected as indicated at P with one another and with the writing plate as well as with one pole of the transmission system T. The electrically conducting stylus D is connected to the other pole of the transmission system. In this manner there results at the input of the transmission system two alternating currents of different frequency which characterize the point where the stylus is to be placed on the writing plate, after the stylus has been brought into engagement with any point of the writing plate. However, the common point P establishes also a connection between the two adjacent bridging members C which in turn lead to a distortion of the two fluxes. Thus, for instance, the lines of flow of current running in the downward direction partly enter the right horizontal arm. This distortion may be eliminated according to the invention by giving both fluxes a common potential point as will be apparent from Fig. 2. Here the centers of the two secondary windings of the energy source repeaters are connected with each other as indicated at P, at which point the potential coincides with the potential at the center of the writing surface. In this manner a mutual influence of the two fluxes is avoided. The voltages at the points of the writing surface which lie symmetrically to the center differ, however, from one another only as regards to the phase and not to the amplitude. In order that the above-mentioned equations hold good it is necessary to add through the repeaters Ü1 and Ü2 a predetermined amount of the two voltages to the tapping voltages.

Another possibility of avoiding a disturbing influence of the fluxes consists in employing a point of the writing surface, for instance, a corner point or a center point as a common point for connecting the transmission system.

The fact that the voltage applied to the transmission system disappears when removing the stylus from the writing plate may be utilized to extinguish and ignite the luminous point in the receiving tube. However, according to the invention an energy source having the frequency f_3 may be connected as shown in Fig. 2 in series with the stylus so that the disappearance and the appearance of the current of this frequency may bring about an extinction and ignition respectively.

When the stylus is brought into engagement with the writing plate the distribution of potential of the fluxes must not be disturbed. The conditions of resistance must therefore be chosen accordingly. Under circumstances it may be preferable to insert a sufficiently high resistance in series with the stylus.

In Fig. 3 is shown the construction of the receiving apparatus. The operation thereof is as follows: The oscillations having a frequency $f1$, $f2$ and $f3$ are separated from one another by the three filters F1, F2, and F3 and rectified in G1, G2 and G3. The two voltages obtained by rectifying the alternating voltages of the frequency $f1$ and $f2$ are supplied to the deflecting systems P1 and P2 of a cathode-ray tube. The voltage obtained by rectifying the alternating voltage of the frequency $f3$ serves to control the intensity of the electron ray of the cathode-ray tube, for instance, through the Wehnelt-cylinder W. Instead of the electric control of the electron rays also a magnetic control may naturally be employed in a known manner.

A complete transmission system according to the invention is shown in Fig. 4 in diagrammatic form. To each end of the transmission system T is connected a transmitting apparatus S as well as a receiving apparatus E so that the operator is always able to observe in his own receiving apparatus the text written by him. In this case he may also ascertain to what extent the lines which have already been drawn disappear again in order to redraw them if necessary.

When using the same frequency for the three directions it is also possible for the other operator to complete the drawing. To facilitate the completion of the drawing and the reproduction of the same the writing plate may be brought according to the invention to coincide with the luminous image. This coincidence may, for instance, be effected by the optical method. This may be accomplished in a simple manner by projecting the fluorescent screen on the writing plate. Another possibility of coinciding the reproduction with the drawing consists in designing the writing plate in the form of a plate permeable to light so that it may be placed on the fluorescent screen. In this case the writing plate may be made, for instance, in the form of a wire gauze or in the form of a metal layer permeable to light and applied to a glass plate preferably by the spraying method. The control means and amplifier lying in the circuits are then preferably so adjusted that the reproduction coincides with the drawing so that when bringing the stylus into engagement with the writing plate the luminous point is directly visible thereunder. With the aid of gain adjusting devices in both circuits F1 G1 and F2 G2 of the receiving apparatus the coincidence of the reproduction with the drawing may easily be adjusted.

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