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MEANS FOR ELECTRICALLY TRANSMITTING IMAGERY

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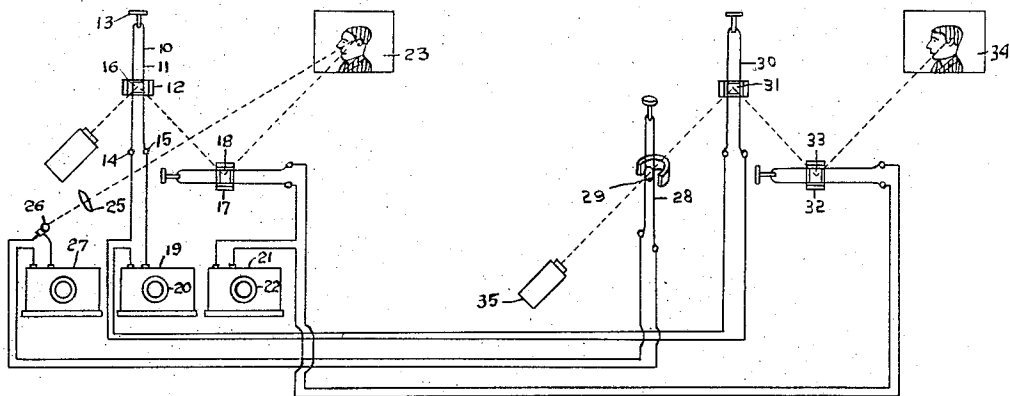


Fig. 1.

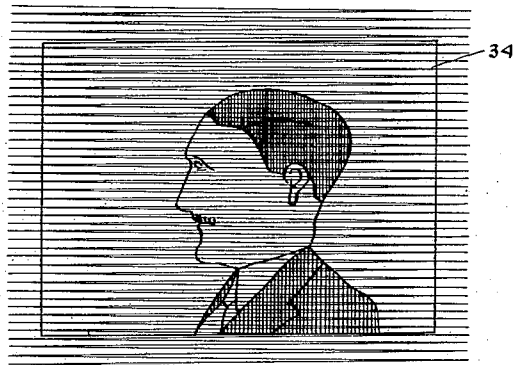


Fig. 2

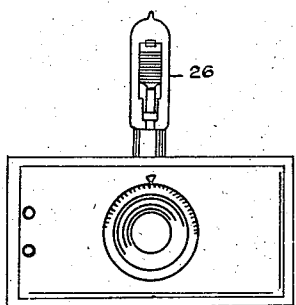


Fig. 4.

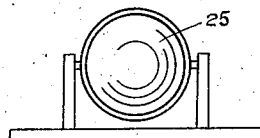


Fig. 3.

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MEANS FOR ELECTRICALLY TRANSMITTING IMAGERY

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The invention relates to means for electrically transmitting imagery, and the objects of the invention are to transmit the image by wire or electrical wave from a sending station to a receiving station with great accuracy as to detail and with considerable speed, in order to follow any movements there may be in the picture and portray without detection by the human eye any distortion due to the rapid changes; to increase the efficiency in the distribution of a pencil of light over surfaces concerned in the reproduction of the picture or image; to eliminate the use in this distribution of the light, all clumsy and weighty machines, as may be seen in the wheels or discs rotated at high speed by electric motors and carrying lenses or mirrors and such like, as employed in most previous television systems; and thereby be able to develop the speed far beyond the limits of such machines; to effect the synchronization of the transmitting apparatus with the receiving apparatus, and to eliminate much complicated mechanism already in use for the purpose of synchronizing the operations at the receiving station with the operations performed at the sending station; to adopt in this invention as far as possible standard parts in the apparatus, which are known as capable of carrying out their own particular functions in other pursuits; to reduce the risks of failure by this adoption of tested devices and speed up the reproduction; to obtain results in the operation of the apparatus at the lowest cost consistent with efficiency and insure low maintenance charges; and generally to provide to the people at their homes or at public places images from afar moving or otherwise that will be an exact showing of the image sent by the sending station, either in the form of a moving picture or original subject, and it consists essentially of the novel means employed, whereby the continuous and rapid distribution of a pencil of light at the sending and receiving stations is made a salient feature as set forth more fully in the description of the details and operation of the invention hereinafter and pointed out broad-

ly and specifically in the claims for novelty following.

In the drawings, Figure 1 is a diagrammatic view showing the suggested relative positions of various members comprising the apparatus at the receiving and sending stations.

Figure 2 shows a view screen on which the image appears following the distribution of the pencil of light thereover.

Figure 3 shows a detail of the lens.

Figure 4 shows a detail of the photo-electric cell and amplifier.

Like numerals of reference indicate corresponding parts in the various figures.

Referring to the drawings, one oscillograph of the sending set is indicated by the numeral 10, and is of electro-magnet type having an up and down wire 11, set between the poles of an electro-magnet 12, a torsion screw 13 at the outer end, and the binding posts 14 and 15 at the inner end. The said binding posts of the oscillograph are connected to an electric circuit energized intermittently by an oscillating current and as the circuit includes the wire 11 the latter is energized in steady oscillations which are produced by any known means, such as oscillating radio vacuum tube or similar hook-up. It is preferable, however, on account of the high frequency to be reached, to secure these oscillations through a radio vacuum tube and in this manner the invention will be described herein without limiting it to the use of an oscillating vacuum tube or any other means of producing the oscillating current.

The oscillograph 10 vibrates the small mirror 16, which is of very light construction, so that the vibration may occur at the rate of one thousand to the second more or less, thereby providing the transverse movement of the pencil of light reflected from the mirror at the rate of one thousand to a second more or less.

The oscillograph 17 carrying the mirror 18, which may be larger than the mirror 16 on account of the lesser number of vibrations, is set at right angles to the oscillograph 10, and vibrates at the rate of sixteen vibrations

to the second more or less, which moves the pencil of light in the other direction, that is to say, up and down at a much slower rate, so as to produce through the compound motion thus produced, a zig-zag movement of the light too fast to be visible to the eye.

The oscillograph 10 is connected up to the radio box 19 providing the oscillating current at one thousand oscillations per second more or less as regulated by the dial 20, while the oscillograph 17 is connected up to the radio box 21 providing the oscillating current at the rate of sixteen oscillations to the second more or less, as regulated by the dial 22.

The object screen 23 belongs to the sending set and carries the photograph to be transmitted, or it may be a living person or moving picture as desired.

A strong pencil of light is directed upon the mirror 16 of the oscillograph 10, from which it is reflected to the mirror 18 of the oscillograph 17, and from thence to the screen. Some of the light reflected by the screen is picked up by the lens 25 and concentrated on the photo-electric cell 26. The photo-electric cell is connected to an amplifying apparatus which greatly amplifies the electrical impulses from it.

At the receiving end, the oscillograph 28 energized by the transmitting current vibrates the opaque disc 29 and the movement of the said disc 29 controls the amount of light passing to the oscillograph 30, which is electrically connected to one of the binding posts of the oscillograph 10 and to the radio box 19, thereby in operation synchronizing with said oscillograph 10 and vibrating the mirror 31 at the rate of one thousand vibrations to the second more or less, as regulated by the dial 20.

The mirror 31 reflects the light passing the opaque disc 29 to the oscillograph 32 at right angles to the oscillograph 30 and particularly to the mirror 33 of the oscillograph 32.

The oscillograph 32 is connected to a binding post of the oscillograph 17 and to the radio box 21 thereby synchronizing with the oscillograph 17 in its operation at the rate of sixteen vibrations to the second more or less, as regulated by the dial 22.

The light beam reflected to the mirror 33 is reflected therefrom to the screen 34 and zig-zags over said screen. And as the light is varied by the oscillograph 28, with the opaque disc, to correspond with the light and dark areas and lines of the object or picture being transmitted, a light image of the original object or picture, here represented by the head and shoulders of a man, is built up on the screen 34.

The several oscillographs mentioned are all of the same type, having their several wires vibrating in a magnetic field and mirrors situated on said wires and therebetween.

In the operation of the invention, where a picture is to be transmitted, either a photograph or a real object or living thing, such as the head and shoulders of a person, the beam light is turned on the picture or object and the oscillators started and tuned up to their selected frequencies.

For simplicity's sake, take a photo pinned up on the transmitting screen, and it will be seen that the spot of light is made to move over the face of a photo in a zig-zag at an extremely high speed, thus exploring the whole surface from start to finish in the fraction of a second, and because the two vibrating oscillographs are operated at the receiving end in the same circuits and by the same oscillating hook-ups that operate these at the sending end they will always be in perfect synchronization, therefore the spot of light on the viewing screen will trace exactly the same path as the spot on the transmitting screen, both spots of light will have precisely the same positions on the respective screens at any given instant.

As the spot of light travels over the photo more or less light will be reflected and picked up by the lens which concentrates it on the photo-electric cell. When the spot of light is moving over a white area, such as a man's collar, a high percentage of light will be reflected to the photo-electric cell, consequently a large flow of current will flow out of the amplifier and over the connections to the light controlling oscillograph at the receiving end and the opaque disc will therefore be caused to turn almost parallel with the beam of light from the lamp 35 used in the receiving set.

In this way most of the light will be let past and will appear on the viewing screen at the proper place; but when the spot of light on the transmitting screen is travelling over a dark area, such as a man's coat, very little light will be reflected to the photo-electric cell, because the most of it will be absorbed by the black of the photograph, thus little or no deviation will occur to the opaque disc and little or no light will get through to the viewing screen, resulting in a dark area, appearing at the proper place on that screen.

It will thus be seen that all details of the photo, light and dark lines and area shadings and tones, will be faithfully transmitted and reproduced on the viewing screen at the receiving end.

In place of a photograph, a real object may be placed in the position of the transmitting screen, and the same action will take place and the object will be accurately and faithfully reproduced on the receiving screen, but on account of the fact that the spot of light travels over the screen area from beginning to end at the rate of sixteen times per second more or less, any motion of the subject will be easily taken care of, such as the wave of a hand, any change of expression on the face, the turn of

the head, and such like, in the same manner as in a motion picture, where so many pictures are flashed successively on the screen per second that all action and motion appears continuous and unbroken to the eye.

In the transmission of moving pictures projected on the transmitting screen, the pictures being only light images on the screen with no actual light and dark substance in them to reflect or absorb more or less of the exploring spot of light, a modification of the invention is used, in which the beam lamp of the transmitter is eliminated and the lens and photo-electric cell put in its place. And the mirror 18 of the oscillograph 17 is slightly dished or concave with the focus point of the reflector falling on the transmitting screen.

With such a long focal length as this mirror will have, the whole screen will be pretty well within the limits of the focus, that is, although theoretically there is only one position on the screen where the focus will be exact, the inexactness of the focus at all other points will be so slight as to be negligible.

Now in operation, this focus point of the concave mirror replaces the exploring spot of light before used, and this focus point moves over the screen in the same way. Thus light is picked up point by point by this collector mirror 18 and conveyed to the photo-electric cell, in other words, light from the light image on the screen is reflected to the photo-electric cell from whatever point on the screen the focus point happens to be at in its zig-zag exploring.

This device can be used to transmit living scenes and real objects by projecting their images on to the screen in the same way as a camera projects an image on to a ground glass screen or onto a film. For great distances amplifying apparatus can be used at the receiving end to amplify all impulses; further, the oscillograph 28 and its opaque disc may be eliminated and instead the impulses from the photo-electric cell used to vary the brightness of the filament of the electric light bulb or the arc light or other electric light used in the beam lamp of the receiver.

In practice it may be possible to eliminate three of the line wires by connecting them all to the ground and completing their circuits that way, but this will be carried out in the various installations according to the conditions of use.

The use of the device is not restricted to transmitting pictures over wires, but may be done by the use of different radio wavelengths, all transmitted simultaneously and received and sorted out coincidentally so that the transmission may be accurately done by radio.

What I claim is:—

In means for electrically transmitting imagery, an oscillograph in a transmitting set

synchronizing with an oscillograph in a receiving set and vibrating at fixed adjustable frequencies, mirrors carried by said oscillographs and vibrating coincidentally therewith, an oscillograph in a transmitting set synchronizing with an oscillograph in a receiving set and vibrating at fixed adjustable lower frequencies than the aforesaid oscillographs, mirrors carried by the lower frequency oscillographs in angular relation to the aforesaid mirrors, said mirrors having a concave member, a screen having the light directed thereon by the transmitting mirrors, a photo-electric cell, a lens introduced between the screen and the photo-electric cell, means for amplifying the electrical impulses from said photo-electric cell, an oscillograph energized by the transmitting current and a mask vibrated thereby and timing the passage to the receiving high frequency mirror, a receiving screen, and lights affording the beams required for the transmission of the picture.

Signed at Toronto this 15 day of February, 1927.

FRANK MORSE ROBB.