July 9, 1929. E. F. WATSON 1,719,916

PICTURE TRANSMITTING SYSTEM

Filed Dec. 31, 1924

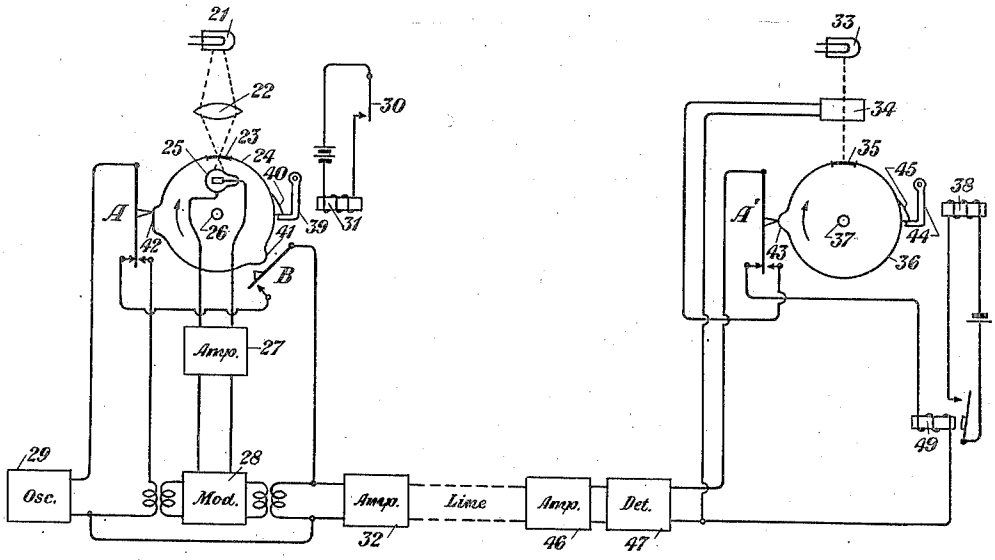


Fig. 1

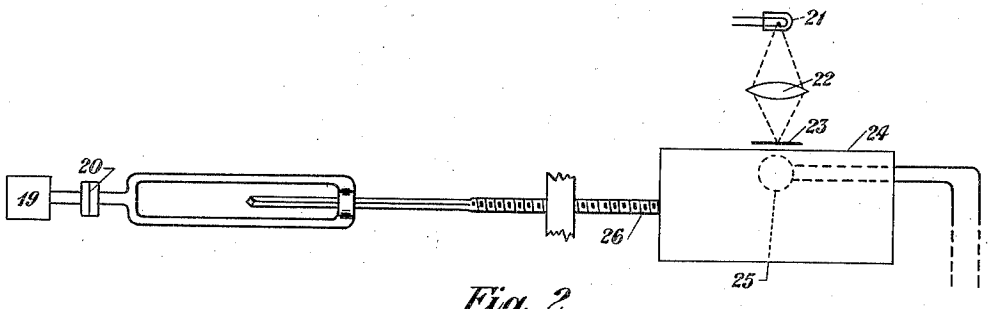


Fig. 2

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Patented July 9, 1929. 1,719,916

UNITED STATES PATENT OFFICE.

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PICTURE-TRANSMITTING SYSTEM.

Application filed December 31, 1924. Serial No. 759,098.

An object of my invention is to provide a new and improved system for synchronizing the transmitting and receiving apparatus in a picture transmitting system. Another object of my invention is to provide for sending synchronizing currents in the same frequency range as the picture transmitting currents. A further object is to do this without introducing currents of excessive magnitude that might produce objectionable inductive effects in neighboring circuits. Another object is to provide a picture transmitting system that shall be simple and inexpensive, easy to operate and easy to keep in order, and free from complications in its operation. These and various other objects of my invention will become apparent on consideration of the following specification and claims taken with the accompanying drawing in which I have illustrated one specific embodiment of the invention. It will be understood that the following specification relates more particularly to this example of the invention and that the invention will be defined in the appended claims.

Referring to the drawings, Figure 1 is a diagrammatic representation of a picture transmitting system embodying my invention, and Fig. 2 is an elevation of a picture transmitting drum.

At the transmitting station at the left of Fig. 1 the picture in the form of a semi-transparent film is wrapped on the glass drum 24 which is mounted to rotate on the shaft 26. The glass drum 24 is open at one end, and the shaft 26 supports it at the other end, and inside of the drum 24 is a photoelectric cell 25. The shaft 26 is screw-threaded in its bearings, so that as the drum 24 rotates it is traversed slowly longitudinally.

Light from the lamp 21 is focused by the lens 22 on a small opening in the screen 23 adjacent to the surface of the film on the drum 24. The light passes through this opening in the screen 23 and through the underlying spot of the picture film on the drum 24 to the photoelectric cell 25.

The quantity of light falling on the photoelectric cell 25 varies in accordance with the degree of shade of the portion of the film underlying the opening in the screen 23. This varies the current accordingly in the circuit of the cell 25, and this current is amplified by the amplifier 27 and applied to modulate a certain carrier current as will be described presently. Further structural details of the transmitting station will be alluded to when the operation of the system is described a little farther along in this specification.

At the receiving station the light from the lamp 33 passes through an electrically controlled light valve 34 and through an opening in the screen 35 to the underlying spot of a sensitive film wrapped on the drum 36. This drum 36 is mounted on a shaft 37 which turns in screw-threaded bearings of the same pitch as for the shaft 26 at the sending end. The sensitive film on the drum 36 will have a shade produced at each spot therein corresponding to the opening of the light valve 34 at the time that the spot underlies the opening in the screen 35.

The apparatus is shown in a condition of rest. Assume that the picture film is in place on the drum 24 at the sending end and the sensitive receiving film is in place on the drum 36 at the receiving end. At both ends motors such as 19 in Fig. 2 are driving continuously by means of friction clutches 20 engaging extensions of the respective shafts 26 and 37. These motors are adjusted, so that the drum at the receiving end will complete a revolution in slightly less time than at the sending end.

To start the system in operation, the operator at the sending end closes the switch 30 whereupon the magnet 31 retracts the hook 39 from the lug 40 on the drum 24. Immediately the drum 24 starts rotating in the direction of the arrow and the lug 41 closes the switch B, thus sending oscillatory current from the oscillator 29 into the amplifier 32 and thence over the line to the receiving end. This received current is amplified at 46, detected at 47 and applied through relay 49 to actuate magnet 38, which retracts the hook 44 from the lug 45 on the receiving drum 36, which thereupon begins to rotate in the direction of the arrow.

Very soon the lug 43 on the receiving drum 36 moves far enough to shift the switch A', thus opening the circuit to the relay 49 and closing a circuit (hitherto open) to the light valve 34.

The closure of the switch B at the sending end by the lug 41 is of short duration, and soon after this switch opens the lug 42 permits the switch A to shift, thus closing the circuit direct from the oscillator 29 to the input of the modulator 28.

The current passing through the modulator 28 is modulated by the current determined by the photoelectric cell 25, so that during the period for the rotation of the drum 24 after its start, a modulated current is sent from the line corresponding to the degree of shade in the successive portions of a narrow strip of the film on drum 24 passing around under the opening in the screen 23. At the receiving station this modulated picture transmitting current determines the opening of the light valve 34 and therefore affects the film on the drum 36 with light corresponding to the degree of shade in the film on drum 24 at the sending end.

The switch 30 remaining closed, the drum 24 rotates continuously at the sending end. Since the drum 36 rotates a trifle faster, it is stopped at each revolution by the hook 44 engaging the lug 45. But just before each such stoppage the picture transmitting current is interrupted by the lug 42 on the sending drum 24 shifting the switch A, thus breaking the circuit from the oscillator 29 to the modulator 28 and making the circuit from the oscillator 29 to the amplifier 32 except for the opening at the switch B. However, immediately after the switch A closes, the lug 41 engages the switch B and completely closes this circuit for a brief duration of time during which the current from the oscillator 29 goes directly to the amplifier 32 and thence over the line and to the magnet 38 withdrawing the hook 44 and releasing the drum 36 for another revolution.

Thus it will be seen that as the drum 24 rotates, successive elemental areas of the picture film pass in helical order under the opening in the screen 23, and in synchronism therewith successive elemental areas of the sensitive film on the drum 36 at the receiving end pass in helical order under the opening in the screen 35.

It will be seen that the currents put on the line for the purpose of synchronizing are within the same frequency range and the same magnitude range as the picture transmitting currents, so that no extension of the frequency range is necessary beyond that for the transmission of the picture shades, and no excessive magnitude of current is necessary such as might produce objectionable inductive effects in neighboring circuits.

I claim:

1. The method of electro-optical transmission over a wire circuit, which comprises scanning a picture or object in successive linear elements, modulating a sustained alternating carrier current in accordance with the shade of successive points in each linear element by continuously varying a characteristic of the carrier current, periodically interrupting said modulating for a brief interval between the scanning of linear elements, and during said intervals transmitting unmodulated alternating carrier current from said source for synchronizing purposes the amplitude of which is not greater than that of the transmitted picture modulated carrier currents.

2. In an electro-optical transmission system, a transmitting station and receiving station, a line connecting said stations, means at said transmitting station for scanning an object in successive linear elements, a source of sustained alternating carrier current, means for modulating carrier current from said source in accordance with the shade of successive points in each linear element by continuously varying a characteristic of the carrier current, and means for periodically interrupting said modulating for a brief interval between the scanning of linear elements and for transmitting during said interval unmodulated alternating carrier current from said source for synchronizing purposes the amplitude of which is not greater than that of the transmitted picture modulated carrier currents.

3. An electro-optical transmission system comprising a transmitting station and a receiving station, a line connecting said stations, a drum at the transmitting station for holding a picture an image of which is to be produced at the receiving station, a similar drum at the receiving station for holding a sensitized film on which said image is to be produced, means at each of said stations for moving said drums so as to traverse the points on said picture and said sensitized film respectively in a helical line with respect to a source of light, a source of sustained alternating carrier current at said transmitting station, means for modulating carrier current from said source in accordance with the shade of successive points on said picture by continuously varying a characteristic of the carrier current, means for controlling the exposure of the film at the receiving station in accordance with the characteristic of said modulated carrier current, means for periodically interrupting said modulating for a brief interval, and means for transmitting unmodulated alternating carrier current from said source during said interval for synchronizing the drums at the transmitting and receiving stations, the amplitude of said alternating current being not greater than that of the transmitted picture modulated carrier current.

In testimony whereof, I have signed my name to this specification this 29th day of December, 1924.

EDWARD F. WATSON.