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R. V. L. HARTLEY

WAVE TRANSMISSION SYSTEM

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Fig. 1

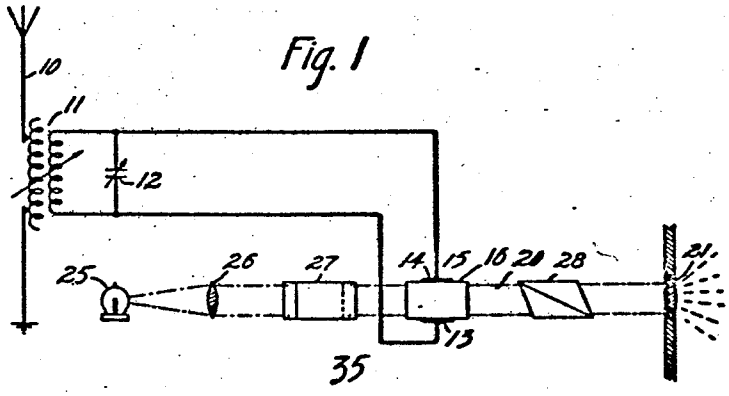
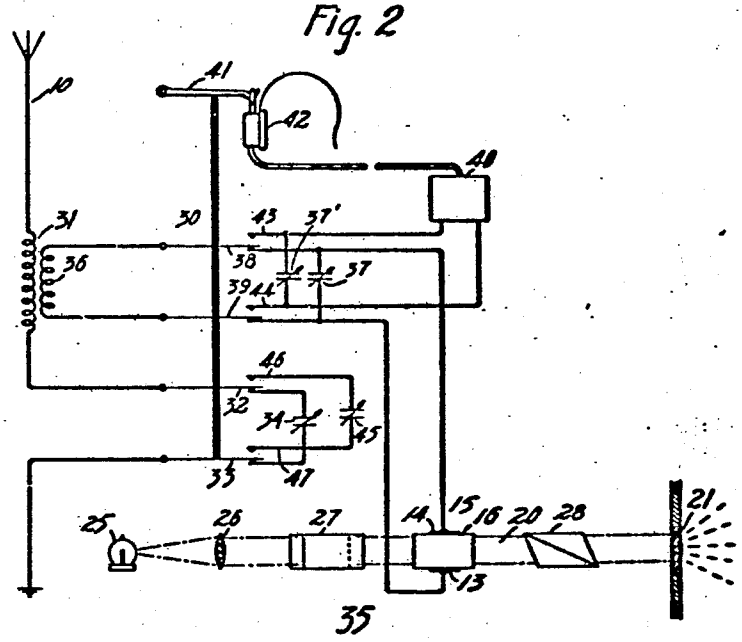


Fig. 2



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by E. W. Adams Atty

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UNITED STATES PATENT OFFICE.

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WAVE TRANSMISSION SYSTEM.

Application filed August 14, 1924. Serial No. 731,914.

This invention relates to wave transmission systems and more particularly to wave receiving systems.

A feature of the invention is the control of the plane of polarization of light in accordance with received waves.

An object is to receive signals without disturbance from undesired waves.

A further object is to cause received waves to produce a visible indication.

A feature of the invention relates to a radio receiving system in which a piezo electric crystal controls the plane of polarization of light to produce a visible signal.

Another feature relates to switching means in a radio receiving system by which a plurality of different signal receivers may be alternately coupled to an antenna and the antenna may be simultaneously tuned to different wave lengths to render it resonant to waves of the corresponding frequency.

The invention broadly comprises means for receiving electric waves combined with a selective device responsive to received waves of a particular frequency. The selective device includes means for polarizing a beam of light so that an object upon which the beam is directed is normally unilluminated and additional means, responsive to the received waves of a particular frequency, to rotate the plane of polarization of the light beam and cause the object to become luminous. The luminous object then indicates to an observer that signals of a particular frequency are being received.

Switching means is also provided whereby the wave receiving means, for example an antenna, may be disconnected from the light signal device responsive to waves of a particular frequency and coupled to a sound signal device, for example a radio telephone receiving set, arranged to be responsive to received waves of a different frequency. The switching means is designed to simultaneously adjust certain tuning elements in the system to the corresponding frequency.

In the drawings:

Fig. 1 is a circuit diagram of a radio receiving system for producing a light signal.

Fig. 2 is a circuit diagram of a radio receiving system having means for alternately connecting a light signal device or a sound signal device to an antenna.

The radio receiving system, the circuit diagram of which is illustrated in Fig. 1, will now be described:

Antenna 10 is coupled to a piezo electric device 15 arranged to rotate the plane of polarization of a light beam 20, directed upon a translucent object 21. The antenna 10 is connected to ground in series with the primary winding of a variable transformer 11. The secondary winding of this transformer is connected in parallel to an adjustable condenser 12, constituting a resonant circuit therewith. The terminals of condenser 12 are connected to plates 13 and 14 of piezo electric device 15 which are arranged adjacent to opposite sides of a parallelepiped 16 cut from a quartz crystal.

Light from a source 25 is condensed by lens 26 and is directed against one face of a Nicol prism or other like polarizing device 27. Adjacent to the opposite face of the prism 27 and arranged to receive light from prism 27 is the piezo electric crystal 16. A second Nicol prism or other light polarizing device 28 is arranged to receive light transmitted through the crystal 16, and is positioned so that it is crossed with respect to the prism 27 when the crystal 16 is at rest. Thus, normally no light is transmitted to the translucent object 21.

The crystal 16 is designed to have a natural frequency corresponding to the frequency of waves which it is desired to receive. The resonant circuit including the secondary winding of transformer 11 and condenser 12 is preferably tuned to the desired frequency. By virtue of this fact the crystal 16 is prevented from responding at any other of its natural frequencies.

When waves of the desired frequency are received by antenna 10 they are transmitted through transformer 11 to the resonant circuit and establish alternating charges upon the plates 13 and 14. The crystal 16 is thereupon set into vibration at the desired frequency. This crystal is sharply resonant and consequently does not respond to received waves of a frequency other than that to which the resonant circuit is tuned and to which the crystal 16 is designed to give response. The vibration of crystal 16 produces a corresponding rotation of the plane of polarization of the light beam 20. Accordingly light is thereupon transmitted to

the translucent object 21 causing it to become luminous as an indication that waves of the desired frequency are being received. The object 21 may be any device sensitive to light as for example a sensitized film upon which a record of the light variation may be made.

The radio receiving system, the circuit diagram of which is shown in Fig. 2, comprises an antenna 10, a hookswitch 30, a light signal device 35 and a sound receiving device 40. The antenna 10 is connected to ground by a path including the primary winding of transformer 31, armatures 32 and 33 of switch 30 and adjustable condenser 34. A secondary winding 36 of transformer 31 the terminals of which are connected to armatures 38 and 39 respectively of switch 30 is arranged to be connected in parallel with either one of two adjustable condensers 37 and 37′ by the operation of switch 30 to form resonant circuits therewith tuned to the proper carrier frequency. The terminals of condenser 37 are connected to break contacts associated with armatures 38 and 39 of switch 30 whereas the terminals of condenser 37′ are connected to make contacts associated with these armatures. The armatures 38 and 39 are also normally connected to the plates 13 and 14 of piezo electric device 15. The armatures 32, 33, 38 and 39 of switch 30 are arranged to be simultaneously operated by a switchhook 41 arranged to support a telephone receiver 42 connected to radio receiver 40. The input terminals of the radio receiver 40 are connected to make contacts 43 and 44 associated with armatures 38 and 39 respectively. An adjustable condenser 45 has its terminals connected to the make contacts 46 and 47 associated with armatures 32 and 33 respectively. The piezo electric device 15 is arranged to control the plane of polarization of a beam of light from source 25 directed by lens 26 through prisms 27 and 28 upon the translucent object 21 in the manner described in connection with the arrangement illustrated in Fig. 1.

The station illustrated in Fig. 2 may be called by waves having a frequency corresponding to the natural frequency of piezo electric device 15 to which resonant circuit 36—37 is tuned. When waves of this frequency are received by antenna 10 the object 21 becomes luminous as already described. This indicates to an attendant that a transmitting station is calling. Telephone communication may be established with the transmitting station by removing receiver 42 from switchhook 41. The armatures of switch 30 thereby move under their inherent spring action to open the normally closed contacts associated therewith and to close the make contacts 43, 44, 46 and 47. The light signal device 35 is thereby disconnected from antenna 10 and the telephone receiver 40 substituted therefor. Likewise condenser 34 which normally tunes the antenna circuit to the frequency of waves received by signal device 35 is disconnected and condenser 45 is substituted therefor. Condenser 45 is provided for tuning the antenna circuit to the frequency of waves to be received by radio receiver 40. By the action of armatures 38 and 39 condenser 37 is disconnected from winding 36 and condenser 37′ substituted therefor which forms a resonant circuit with this winding which is tuned to the carrier frequency used in connection with receiver 40.

The station shown in Figure 2 may be one of a plurality of stations operating over one or a plurality of antennæ. Selective signaling is obtained by employing piezo electric devices adjusted to be resonant at different frequencies. The sound receivers at different stations may be operated on the carrier waves of the same or different frequencies.

Although this invention has been illustrated and described as embodied in certain specific circuit arrangements its limits are not defined thereby but only by the scope of the appended claims.

What is claimed is:

1. A communication system comprising means for receiving carrier waves from a remote station, a source of light, two crossed Nicol prisms in the path thereof, whereby the plane polarized light passing the first prism is prevented from passing the second, means between said prisms responsive to said received waves to rotate the plane of polarization of a beam of light, and means responsive to light traversing both of said prisms to produce an indication that the remote station is calling.

2. A signal receiving station comprising means for receiving incoming energy, an indicating device responsive to polarized light to indicate a call, an optical system associated with said means, and controlled thereby in accordance with incoming energy to effect the calling operation, and means under control of an operator at said signal receiving station for disconnecting said call indicating device from said energy receiving means and connecting in lieu thereof a communication receiving apparatus.

In witness whereof, I hereunto subscribe my name this 7th day of August, A. D. 1924.

RALPH V. L. HARTLEY.