

March 12, 1940.

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2,193,102

DICTOGRAPH

Filed March 19, 1938

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Fig. 1.

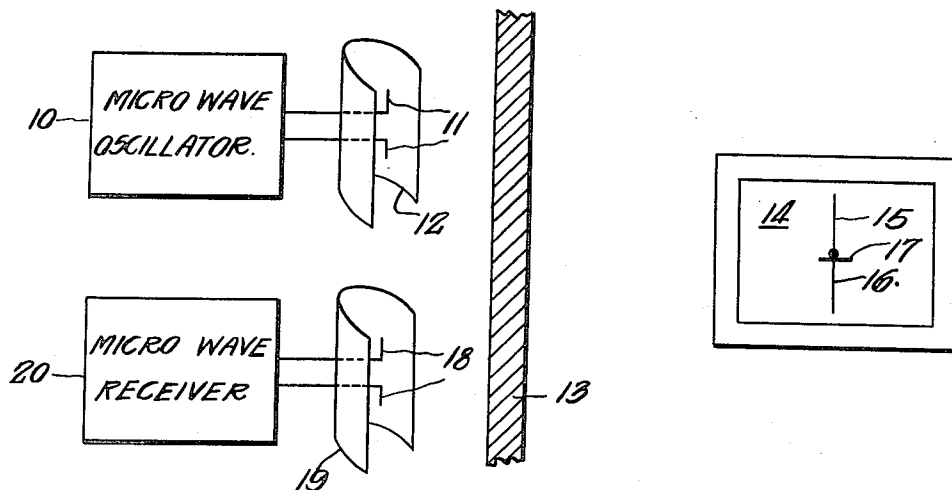
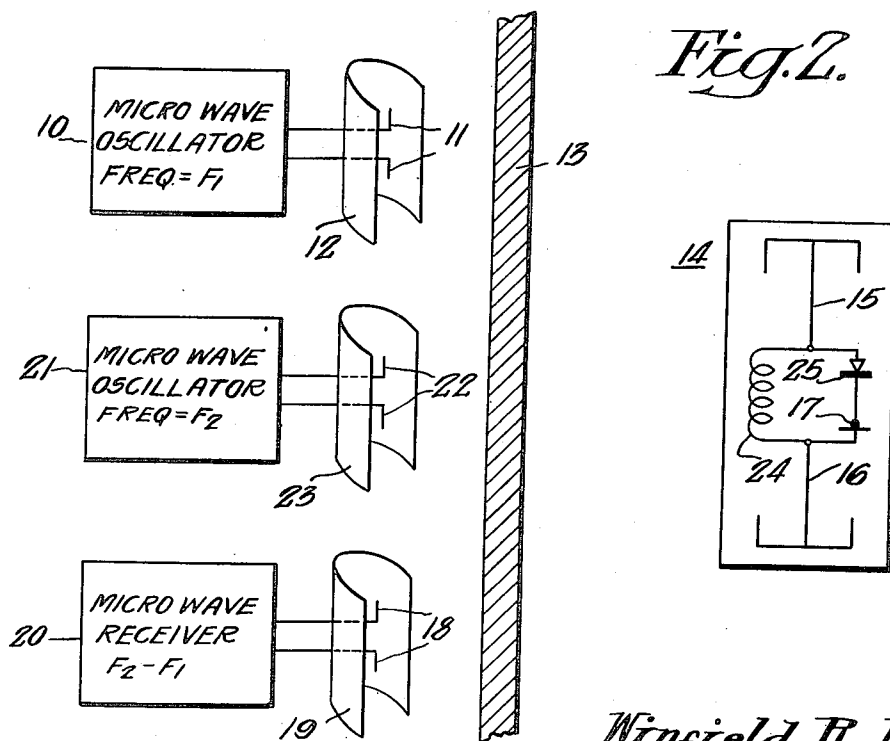


Fig. 2.



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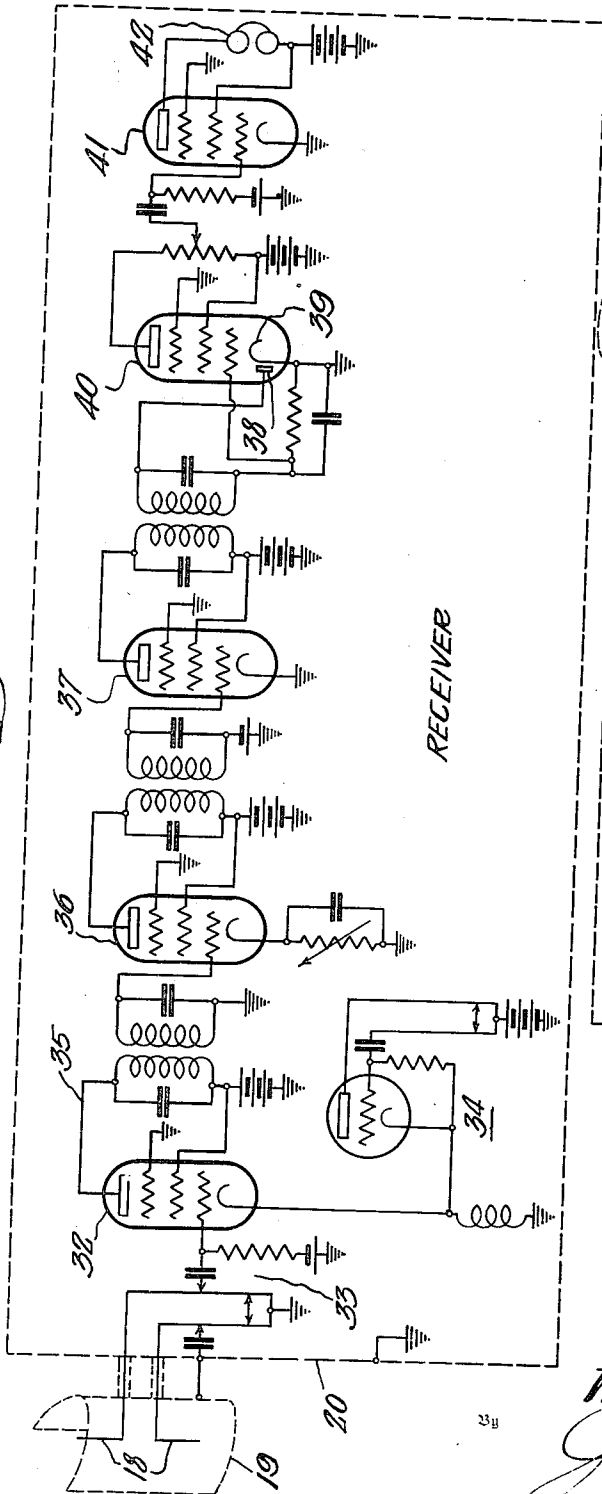
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Fig. 4.



RECEIVER

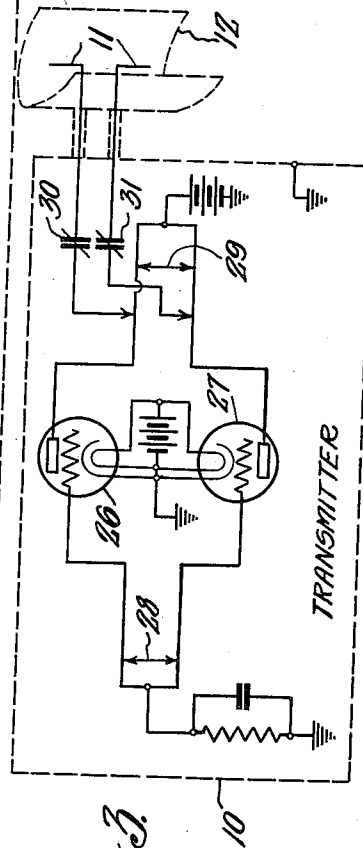


Fig. 3.

TRANSMITTER

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UNITED STATES PATENT OFFICE

2,193,102

DICTOGRAPH

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Application March 19, 1938, Serial No. 196,840

2 Claims. (Cl. 250—6)

This invention relates to dictographs such as are utilized to overhear or record a conversation without observation, and has for its principal object the provision of an improved apparatus and method of operation whereby the use of electrical power sources at the sound pick-up devices and the use of electrical connections between the pick-up device and the receiver are avoided.

As will appear, the dictograph of this invention involves the use of a transmitter for transmitting microwaves, a sound powered microphone and antenna for reflecting these waves, in accordance with the sound received by the microphone and a microwave receiver mounted adjacent the transmitter or elsewhere for receiving the reflected sound modulated microwaves. This dictograph system, of course, depends for its operation on the fact that the antenna resistance is varied in accordance with the sound received at the microphone, and the ability of the antenna to reflect or radiate the microwaves applied to it is dependent on its resistance. The microwaves reflected to the receiver are therefore modulated by the sound and these sound modulated reflected waves may be subjected to the usual detecting and amplifying operations for making the sound audible at the receiver.

Since the microphone and antenna unit is operated altogether in response to the sound waves, requires no sources of electrical power and may have very small dimensions, it is readily concealed about the person of an individual, in a picture frame, a desk cover or the like. The microwave transmitter and receiver may, of course, be located at a considerable distance from the microphone antenna unit in a separate room or building.

The invention will be better understood from the following description considered in connection with the accompanying drawings and its scope is indicated by the appended claims.

Referring to the drawings,

Figure 1 illustrates a dictograph system embodying the invention,

Figure 2 illustrates a modified dictograph system which differs from that of Fig. 1 in that a beat frequency between two different frequency transmitted waves is provided at the pick-up unit in an amount which varies in accordance with the pick-up unit resistance and is radiated to the receiver,

Figure 3 is a wiring diagram of a suitable form of microwave transmitter, and

Figure 4 is a similar diagram of a suitable form of microwave receiver.

The dictograph system of Fig. 1 includes a microwave transmitter which comprises a microwave oscillation generator 10, a dipole antenna 11 and a reflector 12 adapted to cause the microwaves to be radiated in a beam directed through a wall 13 to a sound pick-up device 14. The radiated waves may have a length of the order of 60 to 80 centimeters, for example.

The sound pick-up device may include antenna elements 15—16 between which is connected a carbon microphone 17 or the like. This antenna microphone pick-up unit may be of very small dimensions and is readily concealed about the person of an individual, in a picture frame, a desk cover, a walking stick or the like. Since the microwave reflective properties of the antenna 15—16 depend on its resistance, it will be apparent that the reflected waves are modulated by the sound waves which are applied to and vary the resistance of the microphone 17.

These reflected sound modulated waves are picked up by an antenna 18 which is mounted in a reflector 19 and transmits the received waves to a microwave receiver 20.

The dictograph system of Fig. 2 is similar to that of Fig. 1 in several respects but differs therefrom in that (1) a beat frequency between the waves transmitted from a pair of different frequency microwave transmitters is provided at the sound pick-up unit, (2) this beat frequency is modulated by the sound waves applied to the microphone, and (3) the sound modulated beat frequency signal is radiated to the receiver 20.

This modification of the invention involves the provision of an additional transmitter 21—22—23 which is operated at a frequency different from that of the transmitter 10—11—12 and also the provision of a somewhat different form of sound pick-up device which may include, in addition to the antenna 15—16 and the microphone 17, a coil 24 and a detector 25. When two frequencies are impressed on a non-linear device, such as the crystal rectifier 25, sum and difference frequencies are formed and radiation at these frequencies will occur from the antenna 15. As the resistance of the microphone 17 is varied by the impressed sound waves, the current through the rectifier will change, causing a variation in the amplitude of the sum and difference frequencies produced. It will be noted that the antenna 15—16 is folded back at its opposite ends to reduce its size. As in the arrangement of Fig. 1, the sound modulated signal radiated from the antenna 15—16, corresponding to either the sum or difference frequency of oscillators 10 and 21, is received by the

receiver 18—19—20. This arrangement is advantageous in keeping down undesired stray coupling between transmitters and the receiver, because they operate on different frequencies, and in avoiding masking of the modulated reflected wave by strong unmodulated waves reflected by conductors other than the sound pick-up antenna.

The wiring diagram of one suitable form of transmitter is illustrated by Fig. 3. The oscillation generator 19 of this transmitter includes a pair of push-pull connected electron discharge devices 26—27 provided with input circuits which are tuned by an adjustable member 28 and with output circuits which are similarly tuned by an adjustable member 29. Feed-back between these input and output circuits is through the plate-grid capacitance of the devices 26—27. The output circuits are coupled to the antenna 11 through capacitors 30—31, the antenna leads being connected to the output circuits at such points as ensure matching of the output impedance to that of the antenna. As will be understood, microwaves of a frequency dependent on the adjustment of the tuning members 28—29 are radiated from the antenna 11 in the form of a beam.

This microwave beam, modulated by the sound waves applied to the microphone 17, as previously explained, is received by the receiver 20, the wiring details of which are shown by Fig. 4.

The receiver of Fig. 4 includes, in addition to the antenna 18 and reflector 19, a detector and intermediate frequency amplifier device 32 which is provided with a tuned radio frequency input circuit 33, is associated with a local oscillation generator 34, and is provided with an intermediate frequency output circuit 35. The output of the device 32 is amplified by the intermediate frequency amplifiers 36 and 37 and the intermediate frequency output of the amplifier 37 is detected by the electrodes 38—39 of the combined detector and audio frequency amplifier 40. The audio

frequency output of the device 40 is further amplified by an audio frequency amplifier 41 and supplied to a utilization device illustrated as a loudspeaker 42. It is apparent, however, that the loudspeaker may be replaced by a recorder in case it is desired to record the sound received at the sound pick-up device.

An important advantage of this improved dictograph system is that no sources of electrical power are required at the sound pick-up device and the provision of the usual electrical connections between the transmitter and receiver is rendered unnecessary, thus permitting considerable spacing between transmitter and receiver where the microwave beam path is free of reflecting objects or materials.

I claim as my invention:

1. In a dictograph system, the combination of a pair of microwave transmitters for radiating unmodulated carrier waves of different frequencies, a receiver, means including an antenna and a detector connected in circuit with said antenna for receiving and combining said carrier waves to produce a beat frequency current, a microphone for modulating the beat frequency of said transmitted waves in accordance with sound received by said microphone, said antenna reradiating said sound modulated beat frequency signal to said receiver.

2. In a dictograph system, the combination of a pair of microwave transmitters for radiating unmodulated carrier waves of different frequencies, a receiver, means including an antenna and a detector connected in circuit with said antenna for receiving and combining said carrier waves to produce a difference frequency current, a microphone connected in circuit with said antenna for modulating said difference frequency current, said antenna radiating said modulated difference frequency current to said receiver.

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