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COMMUNICATION SYSTEM

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Fig. 1.

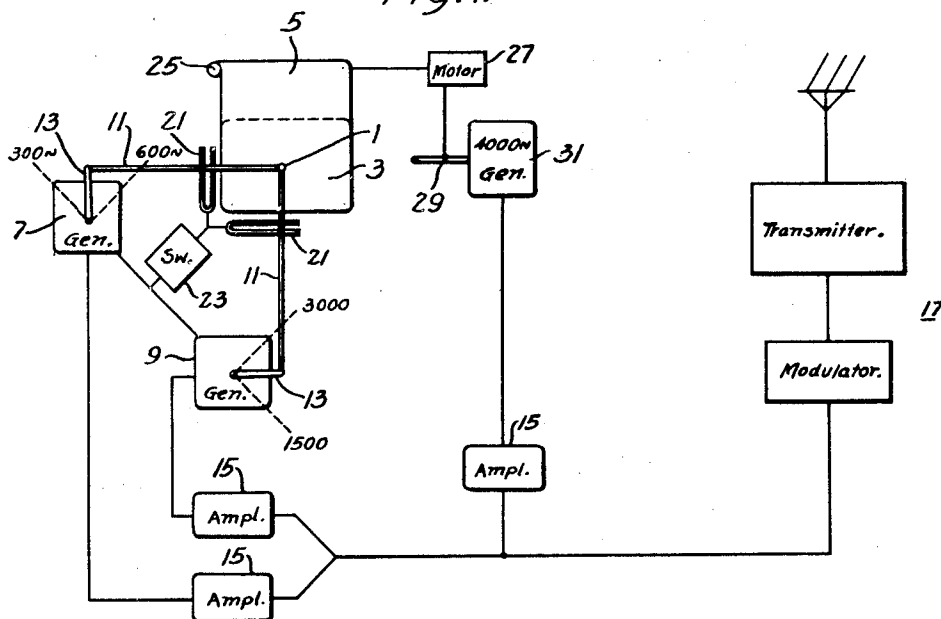
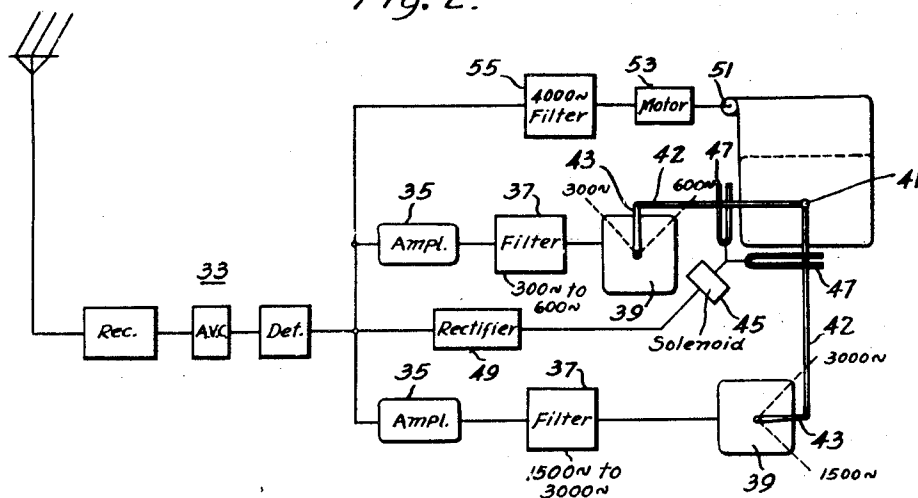


Fig. 2.



WITNESSES:

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COMMUNICATION SYSTEM

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9 Claims. (Cl. 178—19)

My invention relates to radio communication and more particularly to the transmission of written messages or the like.

In the past, the transmission of written messages was accomplished by means of facsimile systems in which the messages were first prepared, by writing or printing the same upon a piece of paper, which paper was then placed into a device where it was scanned by means of photo-electric cells and associated circuits, the electrical currents representing the elements of the message being then radiated. Such systems are comparatively slow in operation, in that not only must the message be first prepared, but it must thereafter be scanned, point for point, throughout its whole surface area.

Such systems also have further disadvantages in that, in order to reproduce the message accurately, the receiving apparatus must be maintained in synchronization with that of the transmitter, and this requires various complicated and critically adjustable circuits.

In the system which I propose, the messages are transmitted and reproduced as they are being written, the coordinates of the reproduced message corresponding at all times with those of the message under transmission, and the system is inherently free of any synchronizing circuits or apparatus and none are required.

An object of my invention, therefore, is to provide a system for the transmission of intelligence which shall be rapid in operation and accurate in the reproduction of the transmitted material.

Another object of my invention is to provide a system of communication by means of written or equivalent matter, which shall be free of synchronizing circuits or apparatus to assure simultaneous operation of both the transmitting and receiving apparatus.

A further object of my invention is to provide a system involving a moving device at the transmitter and a moving device at the receiver, which shall assure simultaneous and similar movements of both devices.

Additional objects of my invention will be disclosed in the following description of the same when taken in conjunction with the accompanying drawing, wherein:

Figure 1 is a schematic diagram of the transmitting system; and

Fig. 2 is a schematic diagram of a receiving system designed to cooperate with the transmitter to reproduce such material as originates at the transmitting apparatus.

The apparatus at the transmitting station com-

prises a device of the tele-autograph type including a stylus 1 which is adapted to be brought into contact with a surface 2 over which paper 5 may be provided for the writing of a message or the like. This stylus is mechanically connected to a pair of oscillation generators 7 and 9 respectively, each being of the adjustable type, and capable of being adjusted, so that the frequency generated thereby may be progressively varied through a range of frequencies. The frequency range of adjustment of one of the oscillators is far removed from that of the other, in order to prevent undue interference between the two. The one oscillator for example may be varied between, say 300 and 600 cycles whereas the other oscillator may generate frequencies between 1500 and 3000 cycles.

The mechanical interlinkage between the stylus and the oscillators may comprise a pair of rods 11, each pivotally joined to an arm 13 which might be fixedly mounted on the shaft of a variable condenser of the oscillator, whereby movement of the arm in response to movement of the stylus will alter the frequency of the oscillator. In lieu of mounting the arm on the shaft of a variable condenser in the oscillator, the arm may be mechanically connected to any variable element of the oscillator capable of causing its frequency to vary through a band of frequencies.

The output of each of these oscillators is fed through an isolating amplifier 15 which may constitute any suitable type of amplifier. Its sole purpose is to prevent energy from one oscillator from entering into the circuit of another and disturbing its operation. These amplifiers therefore, may be identical or they may be designed to have band pass characteristics in accordance with the frequencies they are to handle. The output of these amplifiers may then be combined and impressed upon practically any type of known modulating and transmitting apparatus 17.

The oscillators and their mechanical linkage with the stylus are so designed and adjusted, that with the stylus in the middle of the surface upon which the message may be written, each of the oscillators will be adjusted to a frequency approximately in the middle of its respective band. As the stylus is moved or shifted across the surface in the act of writing or sketching, the frequency of each of these oscillators will progressively change in value, the frequencies thereof for any particular position of the stylus being a measure of the coordinates of that position. Consequently, there will be a different set of fre-

quencies for every point on the surface over which the stylus may be caused to travel.

During interims, in the writing of a message when the stylus is removed from the surface, the oscillators are cut off by means of a switch mechanism of any desired construction actuated by the linkage rods 11 connecting the stylus to the oscillators. This switching mechanism may embody a pair of rods 21, each comprising a pair of prongs or tines, and each engaging one of the rods 11 linking the stylus to the oscillators which rods will be raised upon lifting the stylus from the paper, and lowered when the stylus is brought in contact with the paper. Advantage may be taken of the raising of these rods 21 to operate a switch 23 which, in turn, may be made to cut off the oscillators in any approved manner such as by disconnecting the power supply thereto. Or the operation of the switch 23 may be made to open the circuit at the point where the amplifiers 15 associated with the oscillators 7 and 9 are connected together.

As fresh paper may be desired or necessary, upon which to write additional messages, it may be obtained from a roll 25 under control of a small motor 27 which can be conveniently excited by depressing the stylus 1 into a switch contact 29 to close a circuit to the motor 27. This same switch which closes the circuit to the motor for releasing or withdrawing paper from the roll, may also be caused to simultaneously close a circuit to excite an oscillation generator 31 capable of operating at a frequency of 4000 cycles or at any other frequency outside of the bands of frequencies which the stylus controlled generators 7 and 9 are capable of producing. The output of this generator may also be fed through an isolating amplifier 35 to subsequently modulate the output of the transmitter. This isolating amplifier may be similar to those associated with the oscillators 7 and 9.

The switch contact 29 is located above the plane of the writing surface, so that the oscillators 7 and 9 will be cut off by the switch 23 during the period of providing fresh message pages.

At the receiving station, suitable means are provided for responding to the various signals, sent over from the transmitter, in such a way as to reproduce the movement of the stylus at the transmitter, and also to duplicate the functions of other elements of the transmitting apparatus. Practically any standard receiver 33, preferably one embodying automatic volume control, may be employed to receive these signals from the transmitting station. The output of this receiver will comprise a mixture of the modulating frequencies with which the transmitted carrier wave was modulated, and which represent movements of the stylus, and operation of the motor for providing additional message paper. Since the signals representing these various functions are quite removed from each other in frequency, they may be conveniently isolated into branch circuits.

The signals originating in the stylus controlled oscillator 7 and 9 at the transmitter are amplified through a pair of circuits, each of which is adapted to receive energy within the band of frequencies, associated with one or the other of the stylus controlled oscillation generators, and include an isolating amplifier 35, the output of which is passed through a band pass filter 37 and then employed to control a suitable frequency responsive motor 39, which translate frequency variations into kinetic energy. The motor 39 is

mechanically coupled to a reproducing stylus 41 in much the same manner that the stylus controlled oscillation generators 7 and 9 at the transmitter were coupled to the stylus 1. These frequency controlled motors 39 may be simply described as constituting high torque frequency indicator movements as found in frequency meters, with light connecting rods 42 between their pointers 43 and the recording stylus 41.

In one type of frequency meter, the armature coil assumes a balanced position between two stator coils placed at right angles to each other; one of the stator coils being supplied with the frequency to be measured in series with an inductance and the other coil being supplied with a frequency to be measured in series with a capacitor. Thus as the frequency is varied, the current in one coil increases while that in the other coil decreases and the armature is moved to a position where the fields from the two coils are equal.

Another arrangement might be to use a solenoid in series with a proper size condenser and so designed that the magnetic pull on the solenoid armature working against a spring would be proportional to the current in the solenoid coil and this current in turn passing through a condenser whose reactance was the predominating impedance in the circuit would be proportional to frequency.

The raising or lowering of the recording stylus with respect to the paper or surface on which the message is to be reproduced is accomplished through the excitation of a solenoid 45 in accordance with the presence or absence of signals at the frequencies generated by the oscillators 7 and 9. Thus, when the signal output from the receiver is zero, which condition occurs when the carrier of the transmitter is unmodulated by oscillators 7 and 9, as when these generators are cut off, the stylus should be lifted from the recording surface. A pair of bars or rods 47 similar to those employed at the transmitter, will be mounted to enclose the connecting rods 42 between the prongs thereof and will function to raise the connecting rods upon deenergization of the solenoid. The current for energizing the solenoid at the proper periods is obtained by rectifying the signal output of the receiver by means of a rectifier 49 connected thereto. When such rectified signal energy is present, the solenoid will operate upon the rods 47 to depress the stylus into contact with the paper against the action of a spring tending to normally hold the rods 47 in a position wherein the stylus will be lifted from the surface of the paper.

Movement of the paper from the roll 51 to provide a clean surface for the reproduction of transmitting matter, occurs upon the receipt of signals at the frequency of the oscillation generator 31 at the transmitter, which is energized at the time that the motor for providing fresh paper at the transmitter is excited. Thus, signal energy at this frequency will be used to control a motor 53 for controlling the movement of this paper or the unwinding of the paper from the roll, through a filter 55 adapted to pass energy at this frequency only.

Thus, it will be appreciated that at the transmitting station I have provided rather simple means for modulating a carrier wave at a plurality of frequencies, which vary in accordance with the position of the stylus, the position of the stylus being determined by the message to be transmitted, and that at the receiving station

I have provided a recording means which shall respond to these modulations to control the movement of the recording stylus and constrain it to a path of movement corresponding to that of the stylus at the transmitter.

While I have disclosed my invention in great detail, it will be apparent that various changes may suggest themselves or be apparent to those skilled in the art, and I do not desire to be limited in my protection to the details of my disclosure, except as may be required by the prior art.

I claim as my invention:

1. In combination, a surface, a stylus or the like mounted for movement on said surface, a pair of oscillation generators, each capable of progressive adjustment throughout a widely separated range of frequencies, means interconnecting said oscillation generators with said stylus and means for adjusting said generators simultaneously thereby selecting a particular frequency from each of said range, said frequencies being a measure of the coordinates defining the position of said stylus, and means for transmitting said selected frequencies.

2. The method of communication which comprises moving an instrument through a course which defines the subject matter to be transmitted, transmitting modulation frequencies altered in accordance with the instantaneous changed position of said instrument during its movement along said course, the frequency value of each alteration being a measure of the coordinates of the position acquired by said instrument and utilizing said modulation frequencies to constrain a similar instrument to a path of movement corresponding to that of the first-mentioned instrument.

3. The method of transmitting a written communication or the like, which comprises representing each point in said message by a fixed combination of different frequencies and controlling the movement of a reproducing device in accordance with said combination.

4. In combination, a surface, a stylus or the like mounted for movement over said surface, means responsive to the movement of the stylus for assigning to each spot on said surface traversable by said stylus an identifying combination of frequency values, means for progressively transmitting such combinations of frequencies representing the points on said surface traversed by said stylus in any path of movement thereover, and means for utilizing said transmitted frequency combinations to guide a reproducing stylus over a path of movement substantially identical to that traveled by the stylus at the transmitter.

5. In combination with a stylus or the like the position of which it is desired to indicate at a distance, a means individual to each of a plurality of coordinates to uniquely identify the location of said stylus, means whereby each said means is adapted to generate an electric current of a particular frequency in accordance with the value of its associated coordinate.

6. The combination of elements specified in claim 5 with receiving means provided with an energy-translating device for each said coordinate, each said translating device being responsive to the aforesaid frequency generated which corresponds to variations in value of its associated coordinate.

7. A method of coordinating the movement of a device at a receiving station with the changing position of a device at a transmitting station which comprises modulating a carrier wave simultaneously with signals derived from two predetermined bands of frequencies, each band being identified with one coordinate of travel of said first mentioned device, assigning different combinations of frequencies from said bands for each position which said device at said transmitting station is capable of taking and controlling the positioning of said device at the receiving station in accordance with said assigned frequencies.

8. A method of coordinating the movement of a device at a receiving station with the changing position of a device at a transmitting station which comprises modulating a carrier wave simultaneously with signals derived from two predetermined bands of frequencies, each band being identified with one coordinate of travel of said first mentioned device, assigning different combinations of frequencies from said bands for each position which said device at said transmitting station is capable of taking and controlling the positioning of said device at the receiving station in one coordinate in accordance with one of said assigned frequencies and in the other coordinate in accordance with the other of said assigned frequencies.

9. The method of communication which comprises writing or tracing on a surface with an instrument the subject matter to be transmitted, selecting definite frequency values representing the position of said instrument within the boundaries of said surface for each coordinate of travel thereof during the writing or tracing of the subject matter to be transmitted and utilizing said frequency values to constrain a similar instrument to a path of movement corresponding to that of said first mentioned instrument.

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