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METHOD OF AND APPARATUS FOR MULTIPLEX SIGNALING

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Fig. 2

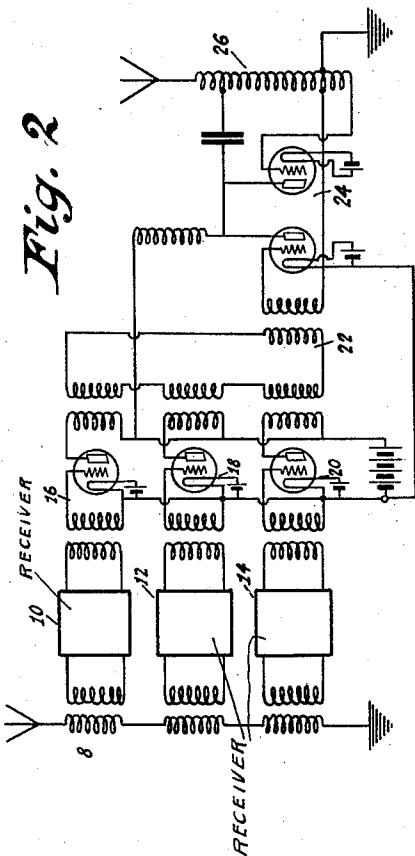


Fig. 1

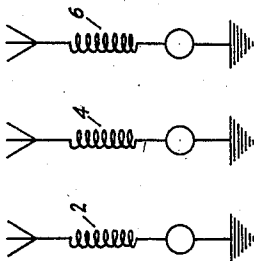
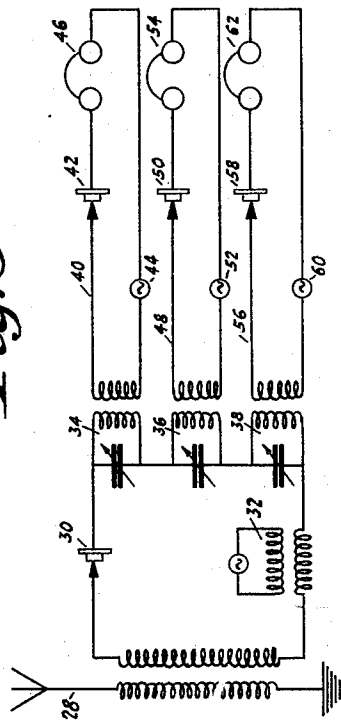


Fig. 3



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METHOD OF AND APPARATUS FOR MULTIPLEX SIGNALING

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This invention relates to a system of multiplex signaling, and particularly to a transoceanic system adapted for telephony or telegraphy.

In accordance with the invention messages may be transmitted from a point or points on one side of a large body of water, such, for example, as the Atlantic Ocean to a point of ultimate reception on the other side of the body of water by modulating and transmitting a plurality of waves of different frequencies respectively in accordance with different messages, receiving said plurality of waves at a point different from the point of ultimate reception, modulating at said point a wave of a still different frequency in accordance with said plurality of waves, and then transmitting the last-mentioned waves thus modulated to the point of ultimate reception where the different messages may be separately received.

This invention has been employed in transmitting messages from different countries of Europe, among which may be mentioned Germany, England and France, to the station of the Radio Corporation of America, located at Riverhead, Long Island. In practicing the invention, the waves used in transmitting the different messages from the various countries of Europe have been of comparatively low frequencies, and the transmitted waves have been received at a station located at Belfast, Maine, at which station they are received upon the same or different antennae and supplied to receivers tuned to the frequencies of the waves radiated from the European stations. The various receivers of the Belfast station are connected to a common antenna through a modulator, and the last-mentioned antenna is caused to radiate a wave of different frequency from the first-mentioned waves, preferably a higher frequency of the order of upwards of 100,000 cycles per second modulated in accordance with the waves to which the respective receivers are tuned.

An important advantage of the invention is that the point, in the present instance, Belfast, Maine, at which the waves transmitted across the ocean are first received may be so

located as to cause interference from static or other causes to be less than would be the case if the transoceanic messages were directly received at the point of ultimate reception; in this case the station at Riverhead, Long Island.

Fig. 1 of the drawing indicates diagrammatically a number of transmitting stations which, for example, may be located in different countries.

Fig. 2 is a diagrammatic illustration of a combined receiving and transmitting station located at a point different from the point of ultimate reception of the messages transmitted by the different antennae of Fig. 1, and

Fig. 3 is a diagrammatic representation of the receiving station at the point of ultimate reception.

The transmitting stations shown in Fig. 1 and designated 2, 4 and 6 respectively may be located at the same or different points on the earth's surface. As one illustration of the use of the invention, the transmitting station 2 may be located in Germany and may transmit a series of waves of 24,000 cycles per second modulated in accordance with a telegraph or telephone message; the transmitting station 4 may be assumed to be located in England and to transmit a signal-modulated wave of a frequency of 21,300 cycles per second; and the transmitting station 6 may be taken as a station in France transmitting a signal-modulated wave of a frequency of 21,000 cycles per second.

The arrangement of Fig. 2 comprises an antenna 8 which is preferably aperiodic and receivers 10, 12 and 14 tuned respectively to the different frequencies of the waves transmitted from the stations 2, 4 and 6. The outputs of the receivers 10, 12 and 14 may next be supplied independently to vacuum tubes 16, 18 and 20 respectively, the output circuits of said tubes being coupled to a common circuit 22 which supplies currents of the different frequencies to which the receivers 10, 12 and 14 are tuned to a modulator 24. As shown in the drawing, the modulator 24 is of the well-known type known as a Heising modulator. The modulator 24 supplies to an antenna 26 coupled therewith a wave of a

frequency different from the frequencies of the waves radiated from the transmitting stations 2, 4 and 6, and the wave radiated from the antenna 26 is modulated in accordance with the respective waves transmitted from stations 2, 4 and 6 and received by the receivers 10, 12 and 14 respectively.

A circuit arrangement such as is shown in Fig. 3 may be employed at the point of ultimate reception to receive the message transmitted from stations 2, 4 and 6 through intermediation of a station having an arrangement such as is shown in Fig. 2. The station shown in Fig. 3 comprises an antenna 28 which may be tuned to the frequency of the wave radiated from the antenna 26. As shown, the antenna 28 is coupled to a circuit including a detector 30 and a heterodyne 32, the frequency of the current produced by the oscillator of the heterodyne device 32 being such as to reproduce approximately from the wave radiated from the antenna 26 of Fig. 2 currents of the frequencies initially transmitted from stations 2, 4 and 6, and there are provided on the output side of the detector 30, circuits 34, 36 and 38 tuned respectively to the frequencies of the waves transmitted by stations 2, 4 and 6. Coupled with the circuit 34 is a circuit 40 including a detector 42, a heterodyne device 44 and telephones 46; coupled with the circuit 36 is a circuit 48 including a detector 50, a heterodyne device 52 and telephones 54; and coupled with the circuit 38 is a circuit 56 including a detector 58, a heterodyne device 60 and telephones 62.

It was assumed above that transmitting stations 2, 4 and 6 might be stations in Germany, England and France, transmitting frequencies of substantially 24,000, 21,300 and 21,000 cycles per second respectively. In the past it has appeared preferable that frequencies of the order of 20,000 to 100,000 cycles per second be used in transmitting messages across large bodies of water, such as the Atlantic Ocean, and where this invention has been employed, it has also seemed preferable to use for the carrier wave employed in the intermediate station shown in Fig. 2 a wave of a frequency of the order of upwards of 100,000 cycles per second. The invention, however, is not limited in its scope to such frequencies nor in its broadest aspects to the use in the station shown in Fig. 2 of a carrier frequency higher than the frequencies of the series of waves transmitted from the stations 2, 4 and 6. On the contrary, it is recognized that it may eventually be found that very short waves may advantageously be employed in transmitting messages over long distances, such as over oceans or other large bodies of water, and, therefore, stations 2, 4 and 6 may be utilized to transmit waves of very short length, and the

station shown in Fig. 2 may utilize as a carrier waves of shorter length.

It is further recognized that various modifications may be made in the manner of utilization of this invention, and, accordingly, it is intended that nothing contained in the foregoing description shall be taken to limit the invention beyond the scope of the appended claims.

Having fully described my invention, what I claim is:

1. A method of multiplex signaling which consists in modulating at different points on the earth's surface at a distance from each other, a plurality of waves of different frequencies adapted to transoceanic transmission in accordance with different messages to be transmitted to a common ultimate point of reception, transmitting said waves and receiving them at a distant point different from the point of ultimate reception, modulating at said different point a wave of still different frequency, adapted to short distance radio transmission in accordance with all of said first-mentioned waves, transmitting said last-mentioned wave thus modulated to the point of ultimate reception and separately translating said different messages at the point of ultimate reception.

2. A method of multiplex signaling which consists in independently modulating a plurality of waves of different, comparatively low radio frequencies adapted to long distance radio transmission in accordance with different messages to be transmitted to a common ultimate distant point of reception, transmitting said waves and receiving them at a distant point different from the point of ultimate reception, modulating at said different point a wave of a higher frequency adapted to short distance radio transmission in accordance with all of said first-mentioned waves, transmitting said last-mentioned wave thus modulated to the point of ultimate reception and separately translating said different messages at the point of ultimate reception.

3. A method of multiplex signaling which consists in independently modulating a plurality of waves of different frequencies of the order of 20,000 to 100,000 cycles per second adapted to long distance radio transmission in accordance with different messages to be transmitted to a common, ultimate transoceanic point of reception, transmitting said waves and receiving them at a transoceanic point different from the point of ultimate reception, modulating at said different point a wave of higher frequency of the order of upwards of 100,000 cycles per second adapted to short distance radio transmission in accordance with all of said first-mentioned waves, transmitting said last-mentioned wave thus modulated to the point of ultimate reception and separately receiving

ing said different messages at the point of ultimate reception.

4. A method of transoceanic multiplex signaling which consists in modulating at points on one side of the ocean at a distance from each other a plurality of waves of different frequencies respectively, in accordance with different messages to be transmitted to a common, ultimate point of reception on the other side of the ocean, transmitting said waves across the ocean and receiving them at a point different from the point of ultimate reception, modulating at said different point a wave of still different frequency in accordance with all of said first-mentioned waves, transmitting said last-mentioned waves thus modulated to the point of ultimate reception and separately translating said different messages at the point of ultimate reception.

In testimony whereof, I have hereunto subscribed my name this 6th day of January, 1925.

ERNST F. W. ALEXANDERSON.