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SYSTEM FOR SOUND TRANSMISSION.

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Patented Aug. 15, 1922.

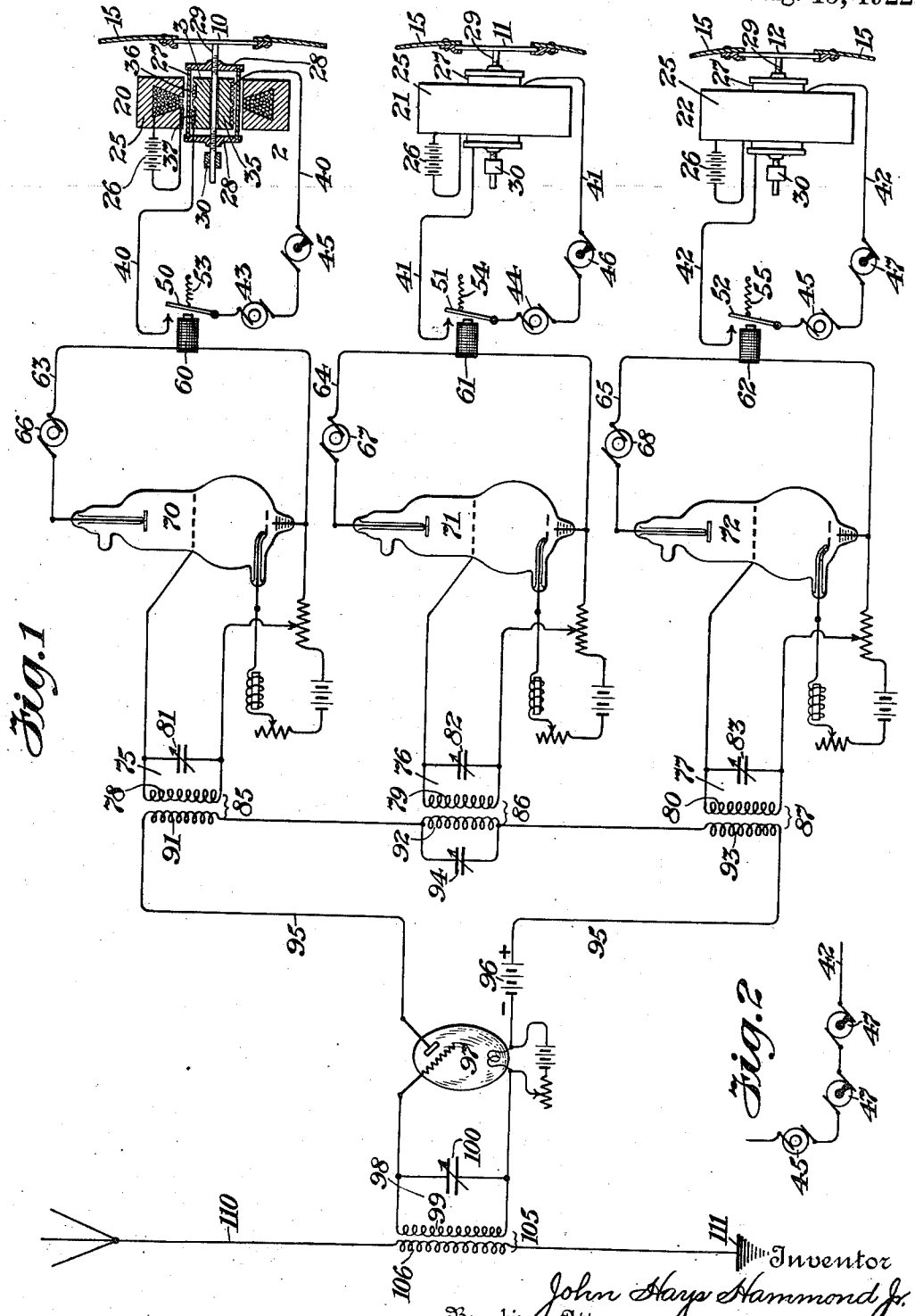


Fig. 1

Fig. 2

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SYSTEM FOR SOUND TRANSMISSION.

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To all whom it may concern:

Be it known that I, JOHN HAYS HAMMOND, Jr., a citizen of the United States, and a resident of the city of Gloucester, in the county of Essex and State of Massachusetts, have invented a new and useful System for Sound Transmission, of which the following is a specification.

Some of the objects of this invention are to provide an improved multiplex sound transmission system; to provide a multiplex sound transmission system which may be controlled in response to electroradiant energy; and to provide other improvements, as will appear hereinafter.

In the accompanying drawing, Fig. 1 is a diagrammatic side elevation partly in vertical section of a multiplex sound transmission system constructed in accordance with this invention; and Fig. 2 is a diagrammatic fragmentary side elevation of a modified form of the same.

Referring to the drawing, one embodiment of this invention comprises a plurality of circular diaphragms 10, 11 and 12, which are arranged to cover circular openings provided therefor in a rigid wall or walls 15, which might be the exterior wall of the hull of a marine vessel, and in that case the diaphragms might be arranged in horizontal alinement beneath the surface of the surrounding water. These three diaphragms are arranged to be vibrated either separately or otherwise by three electrical oscillators 20, 21 and 22 of any suitable construction, the oscillators shown being of a well known construction, and each comprising an annular electromagnet 25 arranged to be energized by a battery 26 and a hollow cylindrical copper vibrator 27 which is surrounded by the magnet 25 and which is clamped securely between two plates 28 which are fixedly secured upon a rod 29, one end of which is rigidly secured to the central portion of the corresponding diaphragm 10, 11 or 12, and the other end of which is arranged to reciprocate in a fixed bearing 30. Arranged loosely within the vibrator 27 is a stationary cylindrical armature 35, which carries an insulated winding which is arranged in two coils 36 and 37 which are wound in opposite directions. The armature coils 36 and 37 of the three oscillators 20, 21 and 22 are in series respectively with three circuits 40, 41 and 42, which are energized respectively by three electrical alternators 43, 44 and 45 having predetermined different frequencies respectively. The three armature circuits 40, 41 and 42 are also arranged to be periodically interrupted or broken respectively by three commutators 45, 46 and 47 which are rotated at uniform but different rates respectively to break up the oscillations in the three circuits 40, 41 and 42, into three series of groups of oscillations having different group frequencies respectively, the group frequency in each circuit being preferably less than the frequency of the corresponding oscillator.

Instead of having only a single commutator 47 in any one or more of the armature circuits, as for instance, circuit 42, two or more commutators 47 may be placed in any one or more of these armature circuits, as shown in Fig. 2, the several commutators being arranged to interrupt the circuit at different regular rates. For instance, when two commutators are used, as in Fig. 2, the commutators would be so rotated as to break up the oscillations in the circuit 42 into sets of groups of oscillations having a "wave" frequency predetermined by the alternator 45, a "group" frequency predetermined by one of the commutators 47, and a "set" frequency predetermined by the other commutator 47. In this manner, a corresponding series of sets of groups of sound waves will be transmitted from the corresponding diaphragm 12, thus giving a triple frequency and making the system more selective.

For controlling the three oscillators 20, 21 and 22 selectively in response to electroradiant energy, the three circuits 40, 41 and 42 are arranged to be controlled respectively by three oscillatory switches 50, 51 and 52, which are normally held open by springs 53, 54 and 55. These switches 50, 51 and 52 are arranged to be controlled respectively by three stationary electromagnets, 60, 61 and 62, which are in three separate circuits 63, 64 and 65, which are arranged to be energized respectively by three high frequency electric alternators 66, 67 and 68, and to be controlled in a well known manner respectively by three mercury vapor detectors 70, 71 and 72, or other suitable detectors, which are arranged in a well known manner to be selectively controlled by three closed oscillatory circuits 75, 76 and 77, which are tuned to different frequencies respectively, and which include respectively

three coils 78, 79 and 80, and three variable condensers 81, 82 and 83. The three coils 78, 79 and 80 form the secondaries of three transformers 85, 86 and 87 having respectively the three primary coils 91, 92 and 93. A variable condenser 94 is shunted around the intermediate coil 92, and the three coils 91, 92 and 93 are arranged in a circuit 95, which is arranged to be energized by a battery 96, and to be controlled in a well known manner by a gaseous detector 97 or other suitable detector, which is arranged in a well known manner to be controlled by a closed oscillatory circuit 98, which includes a coil 99, and a variable condenser 100, the coil 99 forming the secondary of a transformer 105, which includes a primary coil 106 which is in series with an open aerial circuit or antenna 110, which is grounded as at 111. The closed oscillatory circuit 98 which is controlled by the open aerial circuit 110, is preferably tuned to the natural frequency of oscillation of the open aerial circuit which may be for instance 1,000,000 per second, and the three closed oscillatory circuits 75, 76 and 77 which control the three mercury vapor detectors 70, 71 and 72 are preferably tuned to different frequencies respectively, which are each lower than the frequency of the open circuit 110.

This improved system is arranged to be utilized in connection with any suitable system or systems for the transmission of radiant energy, whereby three series of electroradiant oscillations may be selectively transmitted, the three series of transmitted waves having the same wave frequency corresponding to the frequency of the receiving antenna 110, and the closed circuit 98 controlled thereby, and having three different group frequencies respectively corresponding to the three frequencies to which the closed circuits 75, 76 and 77 controlling the three mercury vapor detectors 70, 71 and 72 are respectively tuned.

In the operation of this improved system, when it is desired to vibrate any one of the diaphragms 10, 11 or 12, a corresponding series of waves of electroradiant energy is transmitted, having a wave frequency equal to the wave frequency of the antenna 110, and having a group frequency equal to the frequency to which the corresponding closed oscillatory circuit 75, 76 or 77 is tuned. These incoming waves of electroradiant energy cause the antenna 110 to set up oscillations in the closed circuit 98, which act to operate the detector 97 to permit a unidirectional current to flow from the battery 96 through the circuit 95, and to set up oscillations in the primary coils 91, 92 and 93 corresponding in frequency to the group frequency of the incoming waves, and as this group frequency corresponds only to the frequency to which only one of the controlled closed circuits 75, 76 and 77 is tuned, only that closed circuit will be affected, and oscillations will be set up in that closed circuit 75, 76 or 77 which will cause the operation of the corresponding detector 70, 71 or 72, and thus permit a unidirectional current to flow through the corresponding controlled circuit 63, 64 or 65 from the corresponding alternator 66, 67 or 68, and energize the corresponding electromagnet 60, 61 or 62 to close the corresponding circuit 40, 41 or 42 through the armature of the corresponding oscillator 20, 21 or 22, to vibrate the corresponding diaphragm 10, 11 or 12 accordingly, and to set up sound waves having a wave frequency equal to the frequency of the corresponding alternator 43, 44 or 45 and a group frequency equal to the frequency of the corresponding commutator 45, 46 or 47. By simultaneously transmitting two or three series of groups of waves of electroradiant energy each having a wave frequency corresponding to the frequency of the antenna circut 110, and having respectively group frequencies equal respectively to the frequencies of two or three of the closed oscillatory circuits 75, 76 and 77, a corresponding number of the oscillators 20, 21 and 22 may be simultaneously actuated to produce simultaneously corresponding plurality of series of groups of sound waves having different predetermined wave frequencies and different predetermined group frequencies respectively.

Although only two of the many forms in which this invention may be embodied have been shown herein, it is to be understood that the invention is not limited to any specific construction, but might be applied in various forms without departing from the spirit of the invention or the scope of the appended claims.

Having thus fully described this invention, I claim:

1. The combination with a plurality of sound transmitting devices arranged to transmit respectively a plurality of series of groups of sound waves having different wave frequencies and different group frequencies respectively, of means responsive to radiant energy for selectively controlling said devices.

2. The combination with a plurality of transmitting devices arranged to transmit respectively a plurality of series of groups of compressional waves having different wave frequencies and different group frequencies respectively, means for selectively controlling said devices, and means responsive to radiant energy for actuating said selective means.

3. The combination with a plurality of transmitting devices arranged to transmit respectively a plurality of series of groups

of compressional waves having different wave frequencies and different group frequencies respectively, means for selectively controlling said devices, and means common to said selective means and responsive to radiant energy for actuating said selective means.

4. The combination with a plurality of transmitting devices arranged to transmit respectively a plurality of series of groups of compressional waves having different wave frequencies and different group frequencies respectively, separate means for varying the group frequency of each device, means for selectively controlling said devices, and means responsive to radiant energy for actuating said selective means.

5. The combination with a plurality of transmitting devices arranged to transmit respectively a plurality of series of compressional waves having different wave frequencies respectively, means to produce different group frequencies in the respective series, means to produce a group set frequency in any of said series, and means responsive to radiant energy for selectively controlling said devices.

6. The combination with an electrical vibrator, of means including a source of electrical energy conductively connected to said vibrator for causing said vibrator to produce a series of compressional waves of a predetermined frequency and varied periodically at a plurality of series of different frequencies.

Signed at New York in the county of New York and State of New York this 6th day of June A. D. 1917.

JOHN HAYS HAMMOND, JR.