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2,069,369

SECRET COMMUNICATION SYSTEM

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Receiving Station B

Transmitting Station A

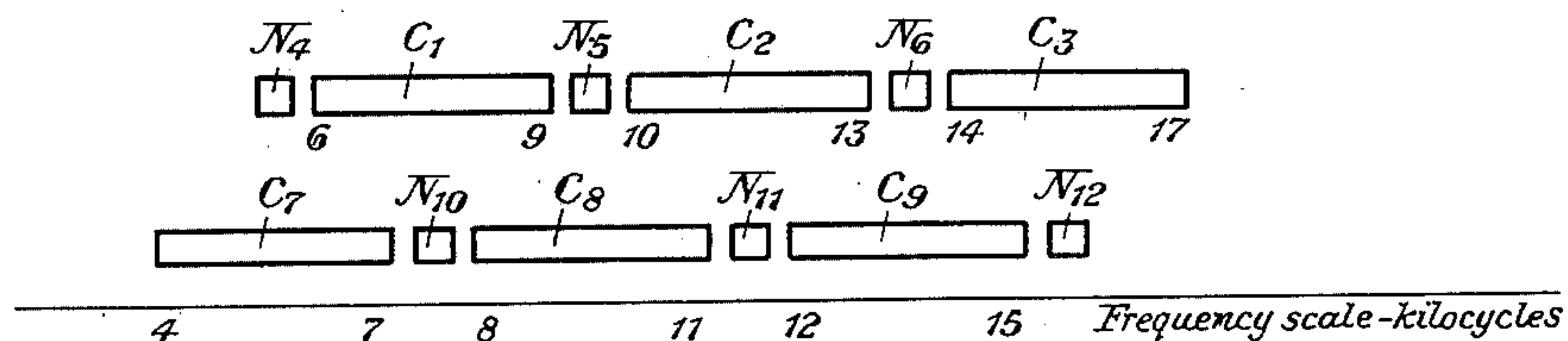
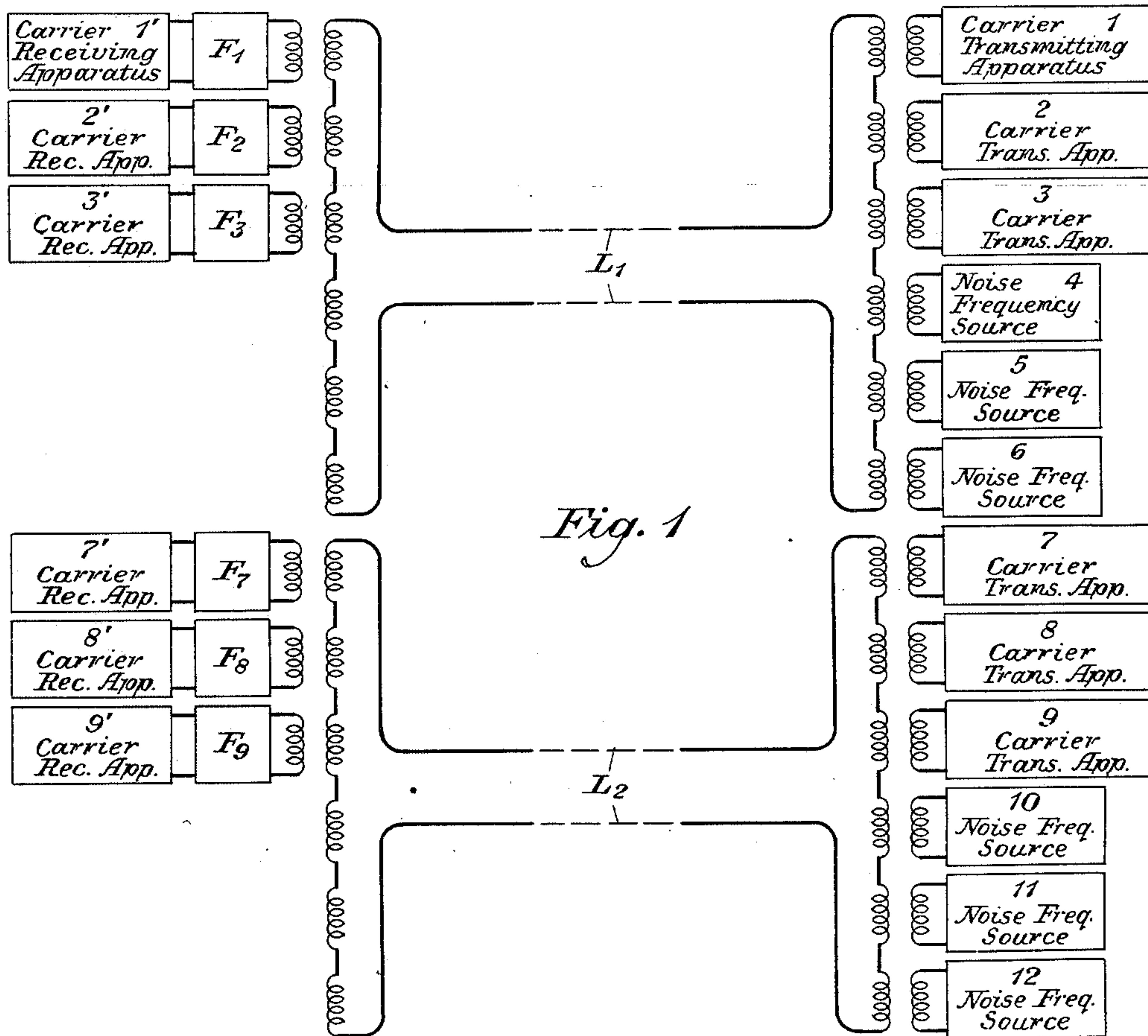


Fig. 2

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SECRET COMMUNICATION SYSTEM

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4 Claims. (Cl. 179—1.5)

This invention relates to communication systems in which carrier currents are utilized for the transmission of messages, and more particularly to a method of and means for providing secrecy in the transmission of messages over such systems.

In the operation of carrier telephone systems on certain types of open wire lines, it is possible that telephone messages transmitted over the carrier channels may be picked up by radio receiving sets located in the vicinity of such lines. For example, it is possible that a sensitive radio set might pick up an intelligible speech signal from such a system if the radio set were located within approximately one mile of the line. It is one of the primary objects of this invention to prevent the possibility of such pick-up of signals by a radio set located in the neighborhood of a carrier telephone system. Other objects and features of the invention will appear more fully from the detailed description thereof hereinafter given.

To accomplish the objects of this invention it is proposed to transmit obscuring signals or noise along the carrier telephone system in such a manner that these obscuring signals or noise will affect a nearby radio receiving set to an extent to prevent a pick-up of the message while at the same time causing no interference with the reception of the telephone messages at the distant end of the line. It is well known that obscuring signals or noise currents have heretofore been transmitted over communication lines to render secret the messages transmitted thereover. However, in such arrangements of the prior art it is always necessary to provide at the receiving end of the system apparatus to filter out or neutralize these obscuring signals or noise currents before the message may be received. In the arrangements of this invention the noise currents are applied to the communication lines in such a manner that they will in no way interfere with the signals transmitted thereover, and no apparatus will be needed at the distant end of the line to neutralize these obscuring signals or noise currents. However, the energy from these obscuring signals or noise currents will be radiated into space simultaneously with the radiation of energy from the message currents, and accordingly, will affect any neighboring radio receiving set to an extent sufficient to prevent it from picking up the message. In order to accomplish this, narrow bands of noise will be transmitted over one pair of conductors between the carrier message bands and on another of the pairs of conductors other narrow bands of noise will be transmitted between the carrier message bands transmitted over that pair. The frequency allocation of the message bands on each pair are staggered with respect to each other so that when a radio set is tuned to

a message channel on one of the pairs, it will also be tuned to a noise band on the other of the pairs and the message will be rendered unintelligible. As the noise bands are located between the message bands, the usual filters at the receiving station will discriminate against the noise and no additional apparatus will be needed for adequate reception of the signals.

The invention may be more fully understood from the following description together with the accompanying drawing, in the Figures 1 and 2 of which the invention is illustrated. Fig. 1 is a circuit diagram illustrating a preferred embodiment of the invention and Fig. 2 is a diagram showing a desirable frequency allocation of the carrier bands which may be used in the arrangements of the invention.

In Fig. 1 is shown a carrier system which might include the lines L_1 and L_2 interconnecting a transmitting station A and a receiving station B. At the transmitting station A there might be connected to line L_1 the carrier transmitting apparatus 1, the carrier transmitting apparatus 2, and the carrier transmitting apparatus 3. At the receiving station B there would be provided the carrier receiving apparatus 1', the carrier receiving apparatus 2', and the carrier receiving apparatus 3' together with suitable filters F_1 , F_2 and F_3 to receive the different carrier frequency bands transmitted by the aforementioned carrier transmitting apparatus. As shown in Fig. 2, the carrier frequency bands transmitted by the apparatus 1, 2 and 3 might be allocated in the frequency scale as follows:

The carrier transmitting apparatus 1 might transmit a band such as C_1 of from 6 to 9 kilocycles; the carrier transmitting apparatus 2 might transmit a band such as C_2 of from 10 to 13 kilocycles; and the carrier transmitting apparatus 3 might transmit a band such as C_3 of from 14 to 17 kilocycles. Associated with the line L_1 at the transmitting station would be three sources, 4, 5 and 6, each generating and transmitting over the line L_1 an interfering or noise frequency. These noise frequencies would be located between the carrier message bands transmitted by the apparatus 1, 2 and 3. For example, as shown in Fig. 2, the noise band from the source 4 might be represented by N_4 , the noise band from source 5 might be between the message bands C_1 and C_2 , as shown at N_5 , and the noise band from source 6 might be located between the message bands C_2 and C_3 , as shown by N_6 . As these narrow noise bands such as N_4 , N_5 and N_6 are located outside the limits of each of the message bands, they would be discriminated against by the receiving filters F_1 , F_2 and F_3 and would have no effect upon the reception of the carrier message bands at the receiving station B. Connected to the line L_2 at the transmitting station would be carrier

transmitting apparatus such as is shown schematically at 7, 8 and 9. At the receiving station B there would be connected with the line L₂ carrier receiving apparatus such as 7', 8' and 9', each having suitable filters F₇, F₈ and F₉. The frequency bands transmitted by the apparatus such as 7, 8 and 9 might have an allocation in the frequency scale such as shown in Fig. 2, wherein the message band from apparatus 7 would be as indicated by C₇, that of the apparatus 8 as indicated by C₈, and that of the apparatus 9 as indicated by C₉. Connected to the line L₂ at the transmitting station are the noise frequency sources 10, 11 and 12. These will generate and transmit over the line L₂ narrow noise bands located between the carrier channels transmitted over the line L₂. For example, in Fig. 2 the noise band from source 10 would have a position in the frequency scale as shown by N₁₀, that from source 11 as shown by N₁₁, and that from source 12 as shown by N₁₂.

In order to accomplish the objects of this invention, the carrier message bands transmitted over the line L₁ must be staggered with respect to the carrier message bands transmitted over the line L₂. For example, the band C₇ may have a range of from 4 to 7 kilocycles while the band C₁ might have a range of from 6 to 9 kilocycles. The band C₈ might have a range of from 8 to 11 kilocycles and the band C₂ might have a range of from 10 to 13 kilocycles. The other bands would be similarly staggered in their frequency allocation. By thus staggering the message bands and locating the noise bands between message bands transmitted over one line, it will be apparent that anyone tuning in with a radio receiving set to one of the message bands, such, for example, as the band C₁, would of necessity have to at the same time tune in on the noise frequency band N₁₀, which would be within the limits of the said message band. Accordingly, it would be impossible to pick up the signal from the message band C₁ if it were radiated into space because at the same time the noise band N₁₀ would be radiated into space and mask the signal. In a similar manner anyone tuning in to a message band radiated from one of the other lines such as the band C₉ would of necessity be tuned in on the noise band N₆, radiated from the adjacent line, and would be unable to pick up the signal. It would probably be desirable that the energy in the noise band be somewhat greater than that in the speech bands. Obviously the number of carrier transmitting sets and noise frequency sources shown connected with each line is only for purposes of illustration of the invention and the number of sets and noise sources may be varied as desired. Furthermore, the specific frequency allocations given in Fig. 2 are only for purposes of illustration and the message bands may have different frequency allocations.

While the invention has been disclosed as embodied in certain specific arrangements which are deemed desirable, it is understood that it is capable of embodiment in many and other widely varied forms without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. In a carrier communication system utilizing pairs of open wire conductors for the transmission of messages between stations the method of rendering secret messages radiated into space from said conductors which comprises transmitting over one of said pairs a message band and a

noise band outside of the frequency range of said message band, transmitting over the other of said pairs a message band and a noise band outside of the frequency of said last mentioned message band, and staggering the frequency ranges of the bands on one pair with respect to the bands on the other pair so that the noise band on one pair will fall within the frequency range of the message band on the other pair.

2. In a carrier communication system utilizing pairs of open wire conductors for the transmission of messages between stations the method of rendering secret messages radiated into space from said conductors which comprises transmitting over one of said pairs a plurality of message bands and a plurality of noise bands located between and not within the frequency ranges of said message bands, transmitting over another of said pairs a plurality of message bands and a plurality of noise bands located between and not within the frequency ranges of said last mentioned message bands, and staggering the frequency ranges of the bands on one pair with respect to the bands on the other pair so that each noise band will fall within the frequency range of different ones of the message bands on the other pair.

3. A carrier communication system comprising two pairs of open wire conductors for the transmission of messages between stations, carrier transmitting apparatus connected to the first of said pairs at one of said stations, means connected to said first pair at said station for transmitting a band of noise frequencies over said pair outside of the range of the carrier message frequency band transmitted thereover, carrier transmitting apparatus connected to the second of said pairs at said station, and means connected to said second pair at said station for transmitting a band of noise frequencies over said pair outside of the range of the carrier message frequency band transmitted thereover, said carrier message band and noise band on one pair being staggered in frequency allocation with respect to the carrier message band and noise band on the other pair so that the noise band on one pair will fall within the frequency range of the carrier message band on the other pair.

4. A carrier communication system comprising two pairs of open wire conductors for the transmission of messages between stations, a plurality of carrier transmitting sets connected to the first of said pairs at one station for transmitting carrier message bands of different frequency ranges thereover, a plurality of generators connected to said first pair at said station for transmitting thereover different noise frequency bands located between and not within the frequency ranges of said message bands, a plurality of carrier transmitting sets connected to the second of said pairs at said station for transmitting carrier message bands of different frequency ranges thereover, and a plurality of generators connected to said second pair at said station for transmitting thereover different noise frequency bands located between and not within the frequency ranges of the message bands transmitted thereover, the frequency ranges of the bands on one pair being staggered in frequency allocation with respect to the bands on the other pair so that each noise band will fall within the frequency range of different ones of the message bands on the other pair.

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