

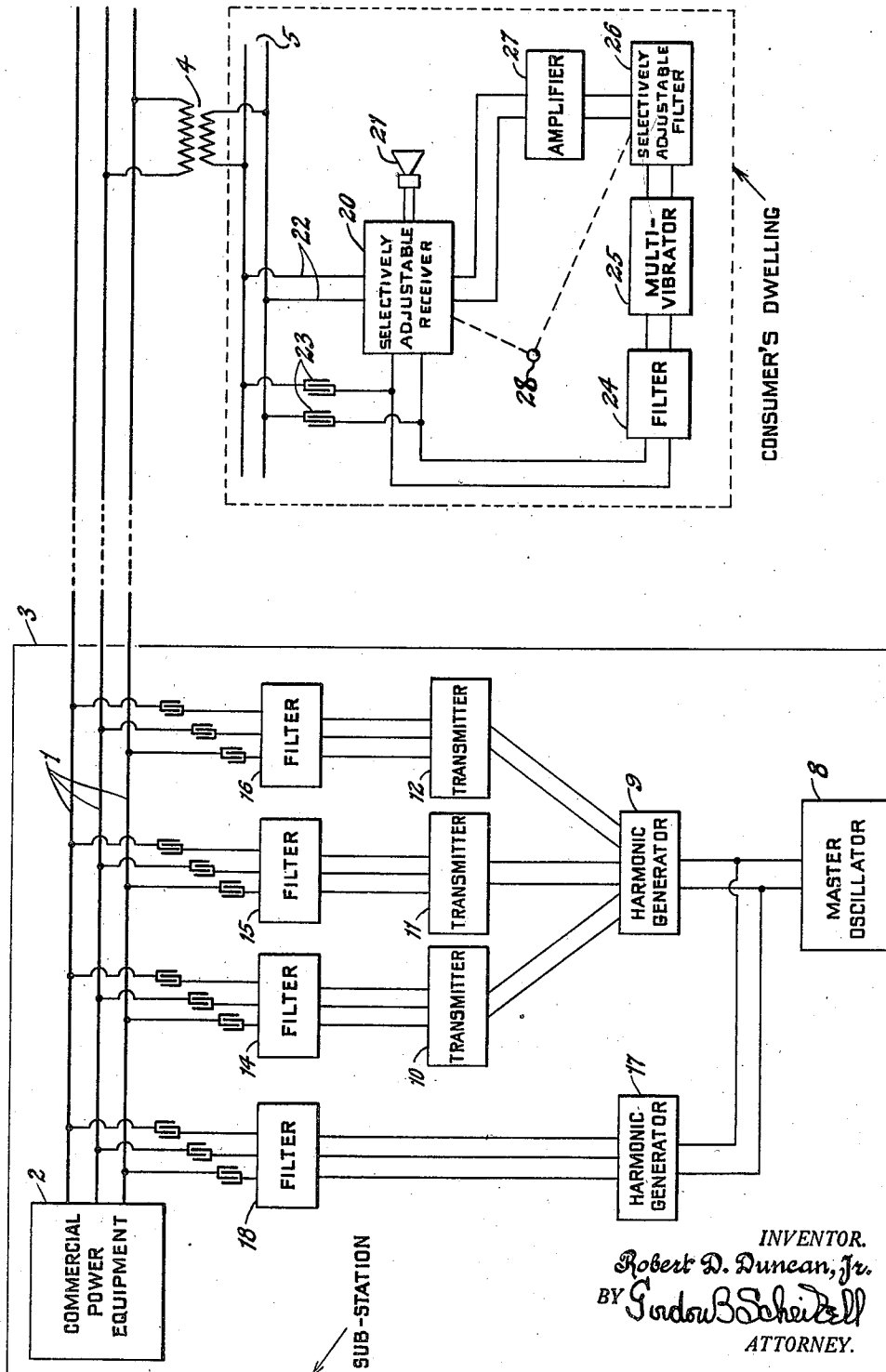
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CARRIER SUPPLY SYSTEM

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CARRIER SUPPLY SYSTEM

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This invention pertains in general to the transmission of programs and specifically relates to such systems for transmitting programs in which the carrier frequency is substantially eliminated during transmission and replaced upon reception.

The principal object of the invention consists in providing a transmission system having means for impressing modulated carrier frequency energy upon a transmission medium with the carrier frequency itself substantially eliminated; said energy being received at a remote point with local replacement of the carrier frequency.

A further object of the invention comprises providing a suppressed carrier transmission system in which an auxiliary higher carrier frequency is transmitted to the point of reception for incorporation with the received energy for carrier frequency replacement purposes.

These and other objects will be apparent from the following, reference being had to the accompanying drawing which represents one embodiment of the system of my invention.

My invention contemplates the provision of a transmission system for developing a plurality of related carrier frequencies from a master oscillator. These carrier frequencies, having a multiple relationship, are each subjected to individual program modulation. Concomitantly, each of the carrier frequencies is eliminated so that the energy impressed upon the transmission medium comprises program modulated carrier energy in the side band regions, the side band regions corresponding to the related carrier frequencies being, of course, discretely situated along the frequency spectrum to produce independent program channels. In the embodiment illustrated, I employ a commercial power network as the transmission medium, although the invention is not to be strictly limited thereto, since other media may be employed without departing from the intended scope of the invention. In carrying out the invention, the transmitted program energy may be restricted to but a single side band of frequencies, when desired.

In accordance with the invention, means are provided for developing, from the master oscillator, an additional carrier frequency arranged substantially higher than those of the program channels. This high carrier frequency is then transmitted over the transmission medium in an unmodulated condition. At the point of reception, the receiving equipment selectively receives any one of the program channels. At the same time, equipment is provided for the reception of the

auxiliary high range carrier frequency which operates through means for producing the desired lower frequencies for carrier replacement purposes. This replacement carrier is then incorporated with the received program energy to replace the suppressed carrier for audible reproduction of the transmitted program.

Referring to the drawing in detail, there is provided a commercial power transmission network 1 connected with power equipment 2. This power equipment 2 may be located in the commercial power substation 3. The lines 1, equipment 2, and sub-station 3 are indicative of a power transmission network in general. In the present instance, the lines 1 are of the three phase 60-cycle alternating current type and operate through a step down transformer 4 to supply commercial voltages to the consumer's local transmission circuit 5.

In accordance with the invention, a master oscillator 8 develops high frequency oscillations of a standard frequency, such as 13 kilocycles. The oscillator 8 may be of a type known in the art, such as a crystal controlled thermionic oscillator circuit. The output of the oscillator 8 is directed to a harmonic generator 9 which develops, from the master frequency, a plurality of harmonically related multiple frequencies. For example, these multiple frequencies may be 26, 39 and 52 kilocycles, respectively, and correspond to different program channels. These different carrier frequencies are respectively directed to transmitters 10, 11 and 12.

The transmitters 10, 11 and 12 each comprise known means for respectively producing amplified three phase carrier frequency energy. The high frequency energy for each transmitter is modulated in accordance with the individual source of modulation energy associated with that transmitter. In addition, each carrier frequency itself is eliminated from the modulated carrier energy so that the output at the transmitter comprises three-phase modulated carrier energy in the side band range with the carrier frequency itself substantially eliminated.

The circuits for such transmission equipment are known in the art. A special form of such carrier elimination and transmission circuits may be seen in my copending application, Serial No. 40,526, as well as in the copending applications of E. A. Laport, Serial No. 52,751, and Serial No. 50,491. The harmonic generator also comprises means known in the art, such as electron tube circuits of standard form, for producing such harmonically related carrier frequencies.

The outputs of transmitters 10, 11 and 12 are directed respectively through filters 14, 15 and 16. These filters limit the output of the transmitters to discrete carrier frequency ranges comprising the different program channels. The output circuits of filters 14, 15 and 16 are directed through capacitive couplings to the lines 1.

A harmonic generator 17 is also connected with the master oscillator 8 for developing high frequency oscillations within a range higher than the carrier frequencies associated with the transmitters 10, 11 and 12. For example, the harmonic generator 17 may develop a frequency of the order of 78 kilocycles. In suitably amplified form, the output of the harmonic generator 17 is directed through filter 18 which limits the output of the harmonic generator 17 to the desired high frequency, such as 78 kilocycles. The output of the filter 18 is then directed through capacitive couplings to the power lines 1.

The consumer's dwelling including the circuit 5 is provided with a receiver 20 and loud speaker unit 21 for audibly reproducing the programs transmitted over the lines 1. The receiver 20 embraces suitable selection, amplification and detection circuits known in the art for reproducing desired programs. The circuits of receiver 20 include electron tubes energized through power connections 22 extending to the circuit 5. The signal input circuit for the receiver 20 is directed through capacitive couplings 23 and also connected with the power circuit 5.

A further circuit is provided from the capacitive couplings 23 to direct signaling energy through a filter 24 to a multivibrator 25. The filter 24 comprises a selective circuit corresponding to the filter 18 and restricted to the range of high frequency auxiliary carrier such as 78 kilocycles developed by the harmonic generator 17. The multivibrator 25 comprises circuits known in the art for producing a sub-multiple of the oscillations of a given high frequency. In the present instance, the multivibrator 25 produces a 13 kilocycle frequency which is the sixth sub-multiple of the 78 kilocycle auxiliary carrier frequency, as well as other frequencies which are harmonics thereof.

The output of the multivibrator 25 is directed to a selective filter 26 having a circuit known in the art for producing a selection among the frequencies directed thereto from the multivibrator. The circuits of the filter 26 are selectively adjustable for passing any one of several harmonic frequencies, as for example, 26 kilocycles, 39 kilocycles, or 52 kilocycles, it being remembered that, in the present embodiment of the invention, the selection circuits of the receiver 20 are adjustable for the selective reception of carrier frequency energy within similar ranges. Accordingly, a common control knob 28 is mechanically connected with the adjustable elements of the selection circuits of receiver 20 and the adjustable elements of the circuits of the filter 26 so that the output of the filter 26 always corresponds in frequency with the selection of the receiver 20.

The output circuit of the filter 26 is directed through an amplifier 27 and thence to the re-

ceiver 20. The circuits of the receiver 20 selectively receive the program modulated carrier frequency energy with the carrier frequency itself suppressed while the output of amplifier 27 supplies this carrier frequency. As a result, the receiver 20 replaces this carrier frequency as supplied from the amplifier 27 so that the desired program can be intelligibly reproduced by the loud speaking device 21.

In another arrangement of the system of the invention, a frequency sub-divider of any type might be substituted for the multivibrator 25. Again, a harmonic generator may be substituted for the filter 26 for producing a selected frequency from the sub-divided frequency.

In another embodiment of the invention, the harmonic generators 9 and 17 may be combined in a single unit so that one harmonic generator serves to produce the carrier frequencies for the transmitters 10-12, as well as the auxiliary carrier frequency passed through filter 18.

Although I have shown a preferred embodiment of my carrier supply system, it will be understood that various changes can be made without departing from the intended scope of my invention. Therefore, I do not desire to limit myself to the foregoing except as may be pointed out in the appended claims.

What I claim as new and original and desire to secure by United States Letters Patent is:

1. In a transmission system in which a plurality of modulated suppressed-carrier high-frequency bands and carrier replacement high frequency waves are transmitted to a receiving point as discrete frequencies, receiving apparatus comprising, a receiver selectively operable to receive any one of said plurality of modulated suppressed-carrier high-frequency bands, means responsive to said replacement carrier waves for supplying to said receiver any one of several replacement carrier frequencies corresponding to the carrier suppressed from said modulated high-frequency bands received by said receiver, and common control means for operating said last mentioned means and said receiver so that when a particular modulation band is received by said receiver, said last mentioned means operates to supply thereto a corresponding replacement carrier frequency for intelligibly reproducing the desired modulation by said receiver.

2. In a transmission system in which a plurality of modulated suppressed-carrier high-frequency bands and a carrier replacement wave are transmitted at different frequencies to a receiving point, a receiver selectively operable to receive any one of said plurality of modulated suppressed-carrier high-frequency bands, a replacement carrier means for receiving said replacement wave and adapted to generate therefrom a plurality of replacement carrier waves corresponding to the carriers suppressed from said bands, and common control means for conjointly operating said receiver to receive a selected band and said replacement means to supply thereto a corresponding carrier wave of the proper frequency for replacement purposes.

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