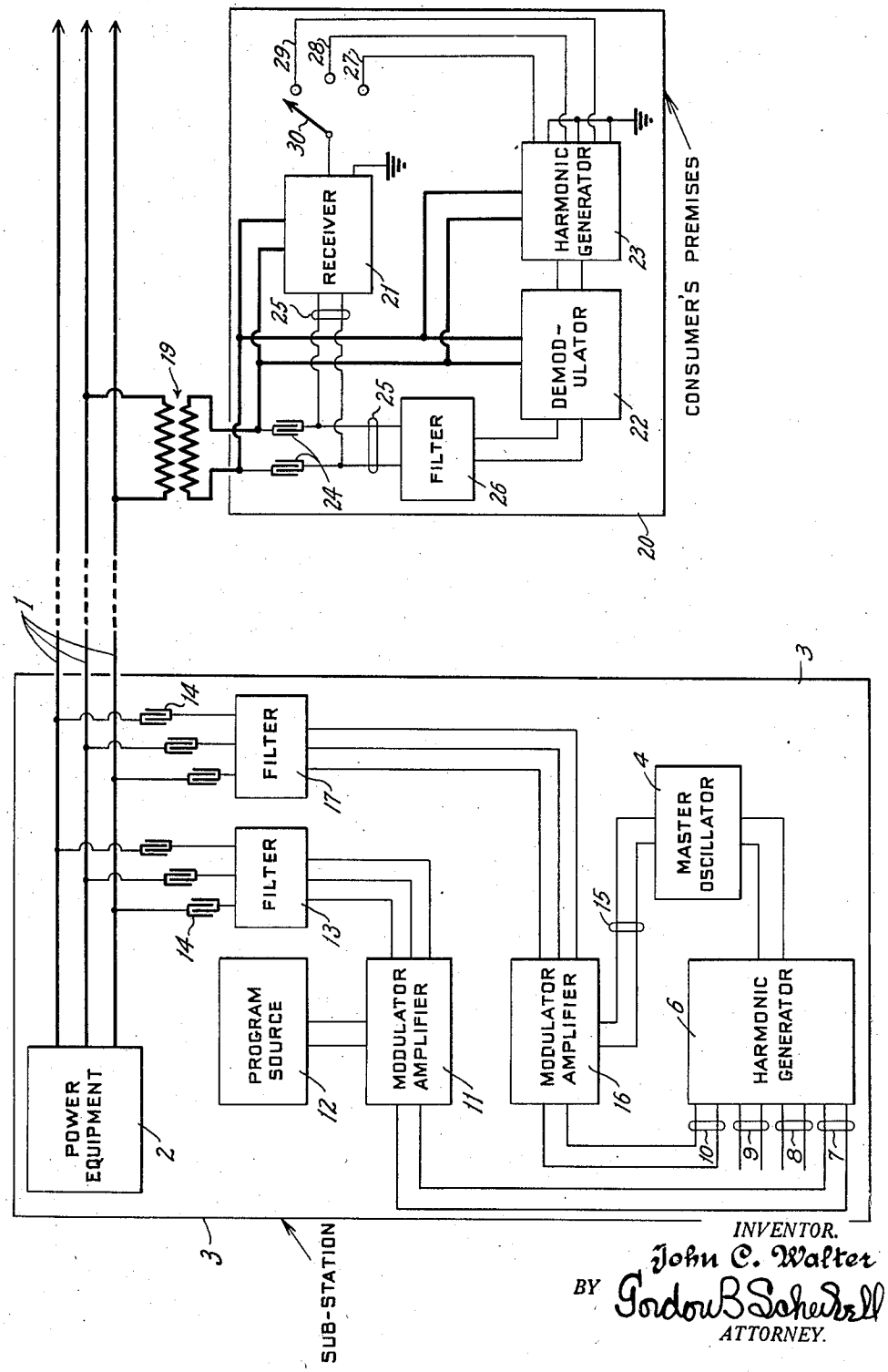
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CARRIER TRANSMISSION

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CARRIER TRANSMISSION

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4 Claims. (Cl. 179—15)

This invention pertains in general to the transmission of programs, and specifically relates to a system of the suppressed carrier frequency type.

The principal object of my invention consists in providing a signalling transmission system of the suppressed carrier frequency type having means for transmitting an auxiliary carrier frequency as a modulation side band for reception at a remote receiving point in connection with a carrier frequency replacement operation at said remote receiving point.

Another object of the invention comprises providing a transmission system for simultaneously transmitting modulation energy corresponding to intelligence signals and to carrier frequency oscillations.

A still further object of the invention consists in providing an arrangement for producing a multiplicity of harmonically related oscillation frequencies and modulating one of said frequencies with a carrier frequency for transmission to a remote reception point for use at said reception point in combination with other received frequencies.

These and other objects will be apparent from the following, reference being had to the accompanying drawing which diagrammatically represents a preferred embodiment of the invention.

The invention contemplates the transmission of programs by modulated high frequency energy in which the carrier frequency is substantially eliminated, thereby leaving only the modulation side band energy for transmission purposes. In accordance with the invention, the modulated high frequency energy is limited to a single side band and transmitted to a remote point of reception, at which point an auxiliary carrier frequency is combined with received single side band high frequency energy to audibly reproduce a received signal or program.

It is a feature of the invention that the auxiliary carrier frequency is utilized to modulate high frequency oscillations of a higher frequency so as to produce modulated high frequency energy having side band modulation, which modulation corresponds to the desired auxiliary carrier frequency. Upon reception, the carrier modulated frequency energy is demodulated to produce a base frequency for carrier replacement purposes at the point of reception. This base frequency is then utilized to control an harmonic generator to produce a plurality of harmonically related carrier frequency oscillations of different frequencies suitable for combination with the received program modulated high frequency energy with carrier suppressed to reproduce the original program modulation.

Referring to the drawing in detail, power lines 1 extend from power equipment 2 in substation 3 and represent a commercial power distribution network supplying three-phase 60 cycle alternating current at suitable voltages. A master oscillator 4 is provided for producing high frequency oscillations of a base frequency, which, by way of example, may be 13 kilocycles. The oscillator 4, as well as other units described in this specification, comprise electrical organizations known in the radio art for producing the desired and described results. As an illustration, the master oscillator 4 may include crystal controlled electron tube oscillation circuits generating the desired frequency.

The master oscillator 4 operates into an harmonic generator 6. The harmonic generator 6 produces several desired carrier frequencies such as 26 kilocycles, 39 kilocycles, 52 kilocycles, and 78 kilocycles, respectively available over the connections 7, 8, 9 and 10. The connections 7 extend to a modulator amplifier 11. The modulator amplifier 11 comprises means including suitable electron tube circuits for producing amplified three-phase high frequency energy having a carrier frequency of 26 kilocycles modulated by modulation energy derived from the program source 12. Such a three-phase system is shown in Patents Nos. 1,622,135 and 1,730,412, issued to Robert D. Duncan, Jr. The output of the modulator amplifier 11, however, operating through filter 13, is limited to a single side band with the carrier frequency suppressed. The output of the filter 13 then operates through capacitive couplings 14 to impress the resultant three-phase single side band carrier suppressed high frequency energy upon the power network 1. Connections 8 and 9 supply their respective carrier frequency oscillations to other modulator amplifiers, similar to the modulator amplifier 11, and operating through associated filters to supply the lines 1 with program modulated carrier frequency energy in other frequency channels or bands.

The master oscillator 4 also supplies the base frequency over connections 15 to a modulator amplifier 16. The modulator amplifier 16 is provided with high frequency carrier oscillations over the connections 10, which, as before pointed out, are of a frequency of 78 kilocycles. This carrier frequency of 78 kilocycles is modulated by

the base frequency of 13 kilocycles supplied over the connections 15 from the master oscillator 4. The modulator amplifier 16, as in the case of the modulator amplifier 11, generates three-phase modulated high frequency energy which, directed through a filter 17, impresses three-phase modulated high frequency energy upon the lines 1. It will be seen that the lines 1 comprise a transmission medium carrying several bands of modulated high frequency energy originated about harmonically related carrier frequencies which have been suppressed for transmission purposes.

The power lines 1 operate through a power transformer 19 to supply commercial alternating current as well as high frequency energy to the receiving circuits contained within the consumer's premises 20. The transformer 19 supplies consumer's voltages to the consumer's network which include power connections extending to the consumer's receiver 21, a demodulator 22, and a harmonic generator 23. Such power connections are for the purpose of supplying operating voltages to the electron tubes contained in these units. In accordance with the invention, capacitive couplings 24 pass high frequency energy to a signalling circuit including input connections 25 to a receiver 21 and filter 26. The receiver 21 comprises a filter-selection circuit and other circuits for selectively receiving program modulated high frequency energy in any one of the several program channels corresponding to the carrier frequencies supplied over connections 7, 8 or 9.

The filter 26 selects frequencies within the range of the carrier frequency of the oscillations supplied over the connection 10, which, in the present instance, is 78 kilocycles. The output of the filter 26 operates into a demodulator 22 which demodulates the received energy to reproduce the base frequency energy supplied over the connections 15. This base frequency is fed into the harmonic generator 23 which then generates, from the base frequency, a plurality of harmonically related carrier frequencies corresponding to the carrier frequencies originally available over the connections 7, 8 and 9. These frequencies are supplied over the connections 27, 28 and 29 to a selector switch 30 which, connected with the receiver 21, supplies the necessary carrier frequency to be combined with the selected modulation side band energy, received from the lines 1, so as to replace the suppressed carrier and reproduce the original modulation.

Although a preferred form of carrier system has been disclosed, it will be appreciated that various changes and equivalent forms can be produced without departing from the intended scope of the 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 desire to secure by Letters Patent of the United States is:

1. A transmission system comprising, a source of base frequency oscillations, a plurality of transmitters controlled by harmonics of said oscillations for producing modulated high frequency energy with carrier frequencies suppressed, said transmitters operating to transmit in discrete frequency ranges, a further transmitter for transmitting a carrier frequency having a different harmonic relationship with said base frequency, means for modulating said carrier frequency under control of said base frequency, receiving means for receiving said frequencies from said first mentioned transmitters as well as from said further transmitter, and means for generating replacement carrier frequencies from the energy received from said further tansmitter and combining the same with the suppessed carrier energy received from said first mentioned transmitters to reproduce selected signals.

2. A transmission system comprising, a source of base frequency oscillations, an harmonic generator supplied with said base frequency oscillations for producing a plurality of harmonically related carrier frequencies from said base frequency, a plurality of modulator amplifiers supplied with said harmonically related carrier frequencies, means for modulating certain of said carrier frequencies with program energy to produce modulated high frequency energy with suppressed carrier, means for supplying another of said modulator amplifiers with said base frequency oscillations as modulation energy so as to produce therefrom a carrier frequency having side band modulation energy corresponding to said base frequency, a remotely situated receiver for selectively receiving said modulation energy frequencies with carriers suppressed, a demodulator for receiving said carrier modulated high frequency energy, and an harmonic generator operated by said demodulator for supplying to said receiver for replacement purposes a plurality of carrier frequencies harmonically related with said base frequency.

3. The method of transmission and reception which comprises generating oscillations at a base frequency, deriving therefrom a group of carriers which are harmonically related to said base frequency, modulating at least one of said carriers by program energy, suppressing the carrier and one of the side bands resulting from said modulation and transmitting one side band thereof over a suitable medium, modulating another of said carriers by said base frequency oscillations and transmitting the same over said medium, receiving said transmissions at a distant point, demodulating the received carrier to obtain the base frequency, deriving therefrom an harmonic frequency corresponding to the said suppressed carrier, and combining said harmonic frequency with the received single side band to reproduce its program.

4. In a system for transmitting and receving high frequency energy in the form of side bands having their carriers suppressed, the method of providing such carriers at the transmitter and replacing them at the receiver which comprises, generating a base frequency and deriving harmonics thereof for carriers, respectively modulating certain of said carriers by programs, suppressing the carriers and one side band of each pair of side bands resulting from said modulation, modulating a different harmonic of the base frequency by said base frequency, transmitting the other side bands of the suppressed carriers together with said base frequency modulated carrier over a suitable medium, reproducing the base frequency from the latter carrier at a receiving point, deriving harmonics of said reproduced base frequency corresponding respectively to the suppressed carriers, and combining a selected one of said harmonics with the corresponding received side band to replace the carrier thereon.

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