A New Chain System

Stations Could Use Same Beat Wave Without Interference

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Many attempts have been made to synchronize two or more broadcasting stations on the same wave. There are many methods available for doing this, and some of them are successful as long as the same program is radiated from the synchronized stations.

Now a company proposes to link 200 stations throughout the country on the same channel by means of two short-wave channels differing in frequency by such an amount that the beat between the two would fall in the broadcast band. For example, the two short-wave channels may be 7,000 and 7,900 kc. When these two are mixed in a modulator or detector there will be a beat frequency of 900 kc, which can be modulated locally for the radiation of any local program desired.

High Powers in Carriers

It is proposed to use 50,000 watts in each of these channels so that both may be received at any point in the United States. Any station desiring to join the synchronized chain would pick-up both of the high frequencies, beat them together in a detector, amplify the beat frequency and ultimately modulate it with a local signal and then radiate it.

It is clear that all the stations using this beat frequency as a local carrier will have exactly the same frequency no matter what may happen to the frequencies producing the beat. If either of the high frequencies varies, then the beat frequency, or the synchronized carriers, will vary also, but all will vary simultaneously and by the same amounts.

Variations Possible

It will of course be necessary to hold both of the high frequencies very steady, for a small relative variation in frequency in any one of them will produce a large variation in the beat frequency. While this will not upset the synchronization it will throw all the receivers of the beat frequency stations out of tune.

The statement that the various stations operating on the beat frequency will at all times be on the same frequency regardless of what that frequency may be, needs some modification. That may not be true while the beat frequency changes, due to changes in the two beating frequencies. There may be momentary differences due to this change while the change is taking place. Also if there are any changes in the transmission paths between any two members of the chain or between the short wave transmitter and any of the members, there may be memomentary differences in frequency.

Neither of the two high frequency waves will carry a signal. The sole purpose of these two waves is to produce a beat frequency which will be used as the carrier of the local signals.

Difficulties Arise

It has been proposed that the local programs consist of similar recorded numbers reproduced mechanically and that all of the stations start at the same time and run their reproducers in synchronism. If the system depends on its success on this synchronization it will obviously prove a failure. No two stations can start their programs simultaneously. But it is not at all certain that this synchronization is necessary to the successful operation of the system. The chief requisite is that the carriers shall be synchronized, and they will be, except for momentary differences.

Of course, if two members of the system are close together so that a receiver is able to pick both up at the same time, the signals will be a hopeless jumble of sounds unless the audio signals of both are identical and closely synchronized. It will not be possible to tune one of them out for they will be on exactly the same frequency. However, if one of the stations is much weaker than the other it will be possible to receive the stronger, as the background of interference will not detract from the desired signal.

High Frequency Modulated

The system as proposed does not include modulation of either of the high frequency carriers. If one were modulated the best frequency could not be used for local modulation because the beat would contain the modulation of the high frequency, just as the beat frequency in a Super-Heterodyne contains the modulation of the high frequency signal.

But for the transmission of chain programs it would be much better to modulate one of the high frequency waves instead of the local beat frequency carrier. Then not only would the carriers of all the local transmitters be synchronized but also the audio signals carried by them, and they would be identical.

When this scheme is employed two transmission channels for the high frequencies would not be sufficient always to insure interference-free reception. A third channel might have to be set apart for the system. This third channel would not be used for anything at all. It would simply be a stand-by.

Why Three Channels

The reason the third channel is necessary to insure freedom of interference is made plain by considering the Super-Heterodyne, for the system is nothing but a Super-Heterodyne on a large scale.

It is well known that any station comes in at two points of the oscillator dial of a Super-Heterodyne, and it is also equally well known that this usually gives rise to squealing and interference. The squeal occurs if there is a broadcasting station in the field which operates on a frequency which differs by twice the intermediate frequency of the Super-Heterodyne.

The intermediate frequency in this synchronization system is the difference between the two high frequencies. If these two are 7,900 and 7,000 kc, the intermediate frequency is 900 kc. Thus if there is a station in the field which differs from either of the high frequencies by 1,800 kc there will be interference from that station. Suppose that the 7,900 kc wave is modulated. It may then be brought in by making the other either 7,000 kc or 8,800 kc. It may well be that a station i operating on 8,880 kc, unless that frequency has been reserved for the system as a stand-by.

Case Is Simpler

However, the present case is a little simpler than the ordinary Super-Heterodyne, because there are only two frequencies, whereas in the Super there are about ninety frequencies. It is possible to eliminate the interfering frequency by suitable circuits. For example, each station might introduce a very effective wave trap for the interfering wave so that it cannot enter the modulator. This might be made directional to make it still more effective. Again, the 8,800 kc wave, or whatever it may be, is so far removed from the modulated wave that an ordinary tuner will be quite effective in suppressing it.

Application has been made to the Federal Radio Commission for construction permit of an experimental station for demonstrating the practicability of the proposed system. The Commissioners are disposed to grant both the construction permit and the station license, but the engineers of the Commission have not yet assented, on the ground that the scheme requires further study.

The applicant is the Continental Broadcasting Company of New York. The proposal is to use 7,000 and 7,900 kc, with 50,000 watts on each for transmission to small stations throughout the country, each of these stations to use the 900 kc beat and to modulate it locally.

The main object of the plan is to enable a large number of stations to operate on the same wave without interfering with one another, and thus conserve channels.

RATES SERVICE FIRST

FIGURING THE RADIO RETAIL BUSINESS HAS COME TO THE POINT WHERE SERVICE IS PARAMOUNT, SAMUEL LAGER, PRESIDENT OF STREAMLINE RADIO STORES CORPORATION, WITH HEADQUARTERS AT 223 FULTON STREET, NEW YORK CITY, HAS OPENED A DEPARTMENT INCLUDING VARIOUS MAKES OF ALL-ELECTRIC SETS