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APPARATUS FOR TIME MULTIPLEXING SPEECH AND SHORT BURSTS OF INFORMATION

Filed Dec. 31, 1953

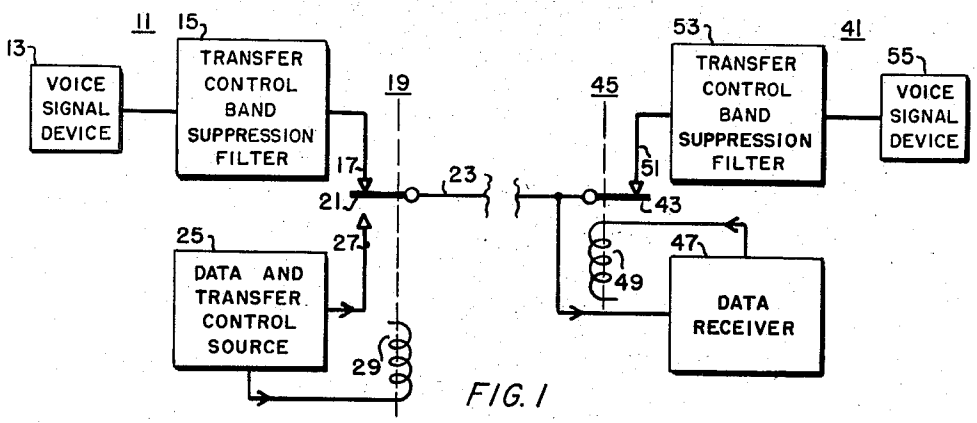


FIG. 1

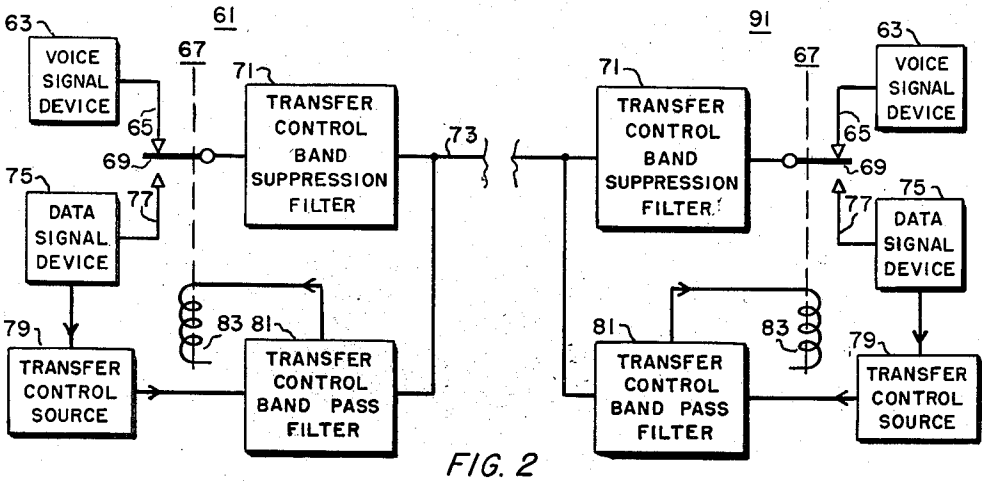


FIG. 2

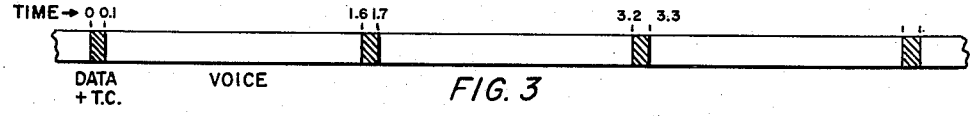


FIG. 3

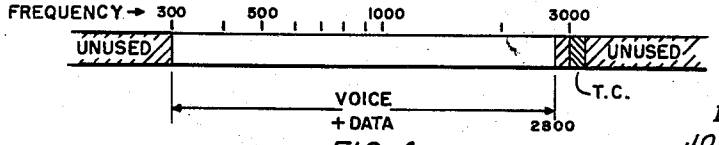


FIG. 4

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APPARATUS FOR TIME MULTIPLEXING SPEECH AND SHORT BURSTS OF INFORMATION

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3 Claims. (Cl. 179—2)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

This invention relates to a multiplex system and, more particularly, to a new and useful communication and data transmission system in which a single channel is used for multiplexing voice signals and short bursts of data signals having a bandwidth similar to that of the voice. The object of the invention is to permit a single channel to serve the dual purpose of voice and data transmission.

It is quie common in modern data transmission systems to transmit data signals of a substantial bandwidth but limited to a fairly small percentage of the available time. When such a signal is transmitted through a separate channel the communication efficiency is very low. It is also fairly common to have a voice channel associated with a data transmission channel, such voice channel operating near its peak efficiency. It has been found practical to transmit both signals over a single channel, having the bandwidth necessary for voice signals, by interrupting the voice signal for a short interval each time the data transmission system is in operation. In order to provide the necessary transfer between use of the channel for voice and data transmission, it has been found quite practical to use a narrow bandwidth signal separate from the voice and data signals and to operate a suitable transfer relay system by this separate frequency. This transfer frequency may be outside the voice band, or limited to a very narrow bandwith within the normal voice signal band, suitably isolated by filters. Because of the short interruptions needed for the data signal and the narrow bandwidth of the transfer frequency there is no abnormal distortion or objectionable effect on the voice signal.

The invention may be understood more fully from the accompanying drawings in which: Figure 1 represents a simple form of the invention permitting data transmission in one direction, Figure 2 represents a modification in which data transmission from both ends of the circuit is permissible, Figure 3 represents a typical time distribution of the various signal components, and Figure 4 represents a typical frequency distribution of the various signal components.

At one station 11 in Figure 1, voice signal device 13 is connected through a transfer control band suppression filter 15 to the normal connection terminal of a transfer relay device, shown as the stationary contact 17 of a magnetic relay 19. The movable contact 21 of the transfer relay is connected to the line circuit 23. A data and transfer control source 25 has its output circuit connected to another stationary contact 27 of the transfer relay 19, and also is connected to the operating coil 29 of the transfer relay in such a way that during data transmission the movable contact 21 will be connected to the stationary contact 27 instead of stationary contact 17 as shown in the drawing. At the other station 41 the

line circuit 23 is connected to the movable contact 43 of the transfer relay 45, and also to the data receiver 47 which is connected to the operating coil 49 of the transfer relay 45, in order that the transfer control source at station 11 can be made to operate the transfer relay 45. The stationary contact 51 of the transfer relay 45 is connected through another transfer control band suppression filter 53 to the voice signal device 55, similar to the device 13 at station 11.

Normally there is a conventional voice signal transmission between the voice signal devices 13 and 55 through the line circuit 23. However, the transfer control band suppression filters 15 and 53 prevent any frequency components from these sources from reaching the transfer relay control winding 49. When the data transmitter is in use the control winding 29 of transfer relay 19 causes the output of the data and transfer control source 25 to be applied to the line. The output of the transfer control source serves to energize the control winding 49 of the transfer relay 45 and therefore disconnects the filter 53 and voice signal device 55 from the line circuit 23. This reduces confusion in the voice signals due to the data signals applied to the line circuit for a limited time. It will be noted that the normal voice channel is a 2-way circuit through the filters and line circuit, while the data and transfer control source at station 11 furnishes data signals to the stationary contact 27 and line circuit 23 and control energy to the transfer relay winding 29. At station 41 the data receiver 47 is controlled from the line circuit 23 and transmits control energy to the transfer relay winding 49.

In Figure 2 a first station 61 has a voice signal device 63 connected to the stationary contact 65 of a transfer relay 67. The movable contact 69 of this transfer relay is connected through a transfer control band suppression filter 71 to the line circuit 73. The data signal device 75 is connected to another stationary contact 77 of the transfer relay 67. A transfer control source 79 is connected to the data signal device 75 so that it is operated during the time data is to be transmitted. The output of this transfer control source is connected through a transfer control bandpass filter 81 to the line circuit 73. The operating winding 83 of the transfer relay 67 is also connected to the bandpass filter so that it is operated by the output of the transfer control source 79, or a similar signal received over the line circuit 73 through the filter. Another station 91 at the other end of line 73 has the same elements and the same arrangement as station 61.

The operation of the circuit shown in Figure 2 is analogous to that shown in Figure 1. However, by means of the circuitry as shown in Figure 2, it is possible to operate from either end of the line circuit, using identical equipment and even operating simultaneously from both ends of the circuit. Of course, it will be understood that the word "simultaneously" is to be construed in terms of the overall purpose of the invention; if data were transmitted from both ends of the circuit during exactly the same "burst" times the line circuits and the data transmitters and receivers would have to be specially designed to avoid interference between the signals. It will also be noted in Figure 2 that the band suppression filters 71 exclude frequencies of the transfer control source between the line circuit 73 and both the voice and data signal devices as shown. Since this transfer control source frequency must be used for the purpose of transfer, its presence in the data channels could have no other significance in the normal operation of data transmission. In Figure 2 signal transmission is in both directions in all circuits, except that the data transmitters 75 serve to operate the transfer control source 79, this sup-

plies energy only to the bandpass filter **81**, and transfer relays **67** are energized from filter **81**.

Figure 3 illustrates a typical relation in the time intervals used for data and voice signals, in which "bursts" of data of 0.1 second duration are transmitted at intervals of approximately 1.6 seconds and the voice signals transmitted during the remaining 1.5 seconds of each interval.

Figure 4 represents a typical relation in the frequencies transmitted over the line circuit in which those frequencies from 300 cycles to 2800 cycles are transmitted through the voice channel and data signal channel, and frequencies of approximately 3200 cycles are used to provide the transfer control energy required to operate the transfer relays.

What is claimed is:

1. A communication system for multiplexing speech and short bursts of data, comprising voice sending and receiving stations having a predetermined available bandwidth, each station including a transfer relay, a voice communication channel normally connected between said stations, data sending and receiving stations associated with said voice sending and receiving stations, respectively, for transmitting short bursts of data of substantially the bandwidth of said channel and being normally disconnected from said channel, transfer control means, including said relays, located at said sending and receiving stations and responsive to a narrow bandwidth signal

frequency for intermittently and sequentially disconnecting said voice sending and receiving stations from said channel and connecting said data sending and receiving stations thereto for periods of only a small fraction of a second duration at intervals of over a second, so that voice communication may be transmitted over said channel simultaneously with, but without abnormal distortion from, said short data pulses, said voice sending and receiving stations including suppression filters for excluding said channel any energy within said narrow bandwidth signal frequency.

2. A communication system as recited in claim 1 wherein said periods are of the order of 0.1 second and said intervals, of the order of 1.6 seconds.

3. A communication system as recited in claim 1 together with voice and short data pulse sending stations located at said receiving stations, and voice and short data pulse receiving stations located at said sending stations, which are connected to said channel so as to provide two-way voice and short data pulse communication over said channel.

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