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(54) Communication signal compression system and method

Verfahren und Einrichtung zur Kompression eines Kommunikationssignals

Procédé et système de compression d'un signal de communication

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Description

[0001] The present invention relates to communication systems and in particular to the compression of communication signals to facilitate increased capacity of the communication system.

BACKGROUND OF THE INVENTION

[0002] Telecommunication systems are well known in the art. From the seminal work of Samuel Morse, U.S. Patent No. 1,647 (1840) and Alexander Graham Bell, U.S. Patent 174,465 (1876), an entire industry of telecommunications has developed spanning the globe and beyond.

[0003] The encoding of messages as well as timing has played a key role throughout the historical development of communication systems. For example, prior to the invention of the telephone, messages were encoded into Morse Code and corresponding electronic pulses transmitted the encoded message over telegraph lines which would then be received and decoded. Thereafter a response could be communicated reversing the operations. Manual encoding and decoding of messages prohibited the direct real time communications between two persons.

[0004] With the advent of the telephone, real time communication was made possible through the electronic encoding of voice patterns into communication signals which signals were carried over wires between two telephones. The speed of the electronic communication signal, which far exceeded the speed of sound, permitted real time voice communication between individuals at substantial distances without significantly perceptible time delay.

[0005] Today communication signals are not constrained to wires but are also carried by a microwave, radiowave and optic fibers. These advances have permitted global real time telecommunications. Moreover, real time communication service is expected by the consuming public.

[0006] Unlike conventional hard wired telephone systems where a single telephone communication signal is carried on a pair of wires, time division multiplexing has been utilized to increase the capacity of the various carrier mediums. For example, many communication signals can be multiplexed together and carried over a single optic fiber. Accordingly a single optic fiber cable can replace a hundred pair wire cable and provide even greater signal carrying capacity.

[0007] The same principle has been employed with respect to radio telephone systems. Radio telephone systems for both stationary and mobile uses are well know in the art. For example, in remote rual areas where installation and maintenance of conventional telephone wire lines is prohibitive, radio telephone systems permit the broadcast between a base and sundry subscriber stations to facilitate telephone service. Mobile radio telephone systems are also becoming increasingly more prevalent in the form of the cellular car phones which have become widely available.

[0008] Radio telephone systems utilize a group of selected radio frequencies tor carrying the communication signals in lieu of wire cables. A typical stationery radio telephone system may include 13 pairs of selected frequencies or channels over which communication signals are broadcast and received between subscriber stations and a common base station.

[0009] Due to the fact that only a limited band of frequencies is permitted for radio telephone usage, time division multiplexing has been employed to permit increased capacity of radio telecommunication systems. For example, U.S. Patent No. 4,675,863 discloses a stationary radio telephone system which utilizes 26 channel pairs each of which can carry up to four communication signals at one time.

[0010] Unlike fiber optic communication transmissions which can speed communication signals to and from their destination in the gigahertz range, carrier radio frequencies (channels) are significantly more limited in their capacity.

[0011] In order to increase the capacity of the radio channels, voice signal compression techniques have been utilized. One technique which has proved successful is Residual Excited Linear Predictive coding (RELP) such as disclosed in WO 86/02726 RELP permits the compression of a 64 kilobits per second voice communication signal into an 14.6 kilobits per second encoded signal which is transmitted over the radio channel. The 14.6 kilobit per second is decoded when it is received to reconstruct a 64 kilobits per second signal with virtually no perceptible loss in signal quality.

[0012] Underlying the mechanics of RELP is a recursive encoding and decoding formulation which relies upon the harmonics of the human voice which provide statistically predictable wave patterns. Unlike voice transmissions, however, data communication signals, such as modem and fax (telecopier) signals, do not exhibit the harmonic qualities which are characteristic of voice signals. Accordingly, the RELP signal compression technique which is employed for voice signals is not entirely suitable for fax and modem communication signals. It would be desirable to provide a more suitable coding compression system for data signals.

[0013] Eurocon '86, 7th European Conference of Electrotechnics, Paris 21 st-23rd April 1986, pages 484-491, F. Jondral et al "On the application of digital signal processing and pattern recognition methods to the automatic classification of high frequency signals" describes a radio monitoring device with the ability to classify high frequency signals, which is based on a learning set natural signals. To this end both linear and quadratic polynomial classifiers are examined

[0014] A method and system according to the preamble of claims 1 and 11 respectively is described in 'Data Compression of Voiceband Modem Signals', D. Lin et

al., 40th IEEE Vehicular Technology Conference, May 6-9 1990.

SUMMARY AND OBJECTS OF THE INVENTION

[0015] An object of the present invention is to provide a radio telephone system which is transparent to the user irrespective of the telecommunication of voice, fax or data. It is a further object the invention to provide an improved data signal compression method.

[0016] Above object and other objects which will become apparent hereinafter are achieved by a method and a system for communicating communication signals, as defined in the appended claims. The system is characterized in its identification of the type of communication signals, such as between voice, fax or modem, and the utilization of different compression methods according to the type of communication signal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

Figure 1 is a schematic diagram of a radio telecommunication system which can utilize the improved data compression processing in accordance with the teachings of the present invention;

Figure 2 is a diagrammatic illustration of the data compression and decoding of communication signals in accordance with the teachings of the present invention;

Figure 3 is a graphic illustration of the frequency domain of a split band modem communication signal;

Figure 4 is a graphic illustration of the frequency domain of a typical fax communication signal;

Figure 5 is a diagrammatic illustration of the frame structure utilized in transmitting a compressed tax signal in accordance with the teachings of the present invention;

Figure 6 is a diagrammatic illustration of the frame structure utilized in transmitting a compressed modem signal in accordance with the teachings of the present invention;

Figure 7 is a diagrammatic illustration of the implementation of the improved coding system within a radio telecommunication system.

DETAILED DESCRIPTION OF A PRESENTLY PREFERRED EMBODIMENT

[0018] Referring to Figure 1, there is shown schematically a base station 11 and a plurality of subscriber stations 10 of a radio telephone system network. The base station 11 is designed to communicate with a number of the subscriber stations 10 simultaneously through the broadcast and reception of radio waves over selected frequencies. The base station is also interfaced with telephone company (TELCO) trunk lines 12. The subscriber units 10 may be stationary such as to provide telephone service to remote areas where the construction of telephone lines is physically impractical and/or cost prohibitive. Alternatively, the subscriber stations 10 may be mobile units such as a car phone.

[0019] A typical system may utilize 26 predetermined channels in the 450 megahertz spectral region. The number of channels is generally limited due to governmental allocation of selected portions of the radio spectrum for radio telephone communications. For example, the Federal Communication Commission (FCC) provides specific regulations in this regard in the United States.

[0020] Base station-subscriber station communication is generally performed over pairs of frequency channels within the designated spectral band. Preferably the base station transmits signals on the lower of the two frequencies in each pair and receives signals from the subscriber station on the higher of the two frequencies of each pair. In a system where 26 frequency channels are available, the base station is designed to simultaneously transmit and receive signals over 13 different channel pairs.

[0021] In order to increase the capacity of such a radio, telephone system, time division multiplexing of communication signals has been utilized. For example, in the radio telephone communication systems disclosed in U. S. Patent No. 4,675,863, issued June 23, 1987, entitled SUBSCRIBER RF TELEPHONE SYSTEM FOR PROVIDING MULTIPLE SPEECH AND/OR DATA SIGNALS SIMULTANEOUSLY OVER EITHER A SINGLE OR A PLURALITY OF RF CHANNELS (Wilson at al.) a telephone system is disclosed which permits up to four communication signals to be communicated over a single pair of radio channels.

[0022] Accordingly, each channel pair is divided into four time slots such that the base station can be simultaneously communicating with four different subscriber stations over a single channel pair. This effectively increases the capacity of the radio telephone system four fold so that over 50 telecommunication signals can be simultaneously communicated over the 13 channel pair radio system. In practice, one of the 52 time slots defined in the 13 channel pairs is reserved for performing system overhead functions, such as the assignment of channels and time slots for the specific telecommunication signals being communicated with selected subscriber stations. Such a time division multiplexing radio telephone system can easily provide normal telephone service for 500 or more subscriber stations.

[0023] One such radio telecommunication system which operates using time division multiplexing is the Ultraphone™ system commercially available from the international Mobile Machines, incorporated, the assignee of the present invention.

[0024] In order to effectuate the increased communication capacity of the radio channel pairs through time division multiplexing, the standard communication signals between subscribers are compressed to fit within the time slot accorded by the time division multiplex sys-

tem. For example, with reference to U.S. Patent 4,675,863, noted above, a typical digitized communication signal of a 64 kilobits per second is compressed into an encoded signal of approximately 14.6 kilobits per second.

[0025] In practice a standard analog telecommunication signal is initially converted into a 64 kilobits per second digital signal. Preferably, the signal is converted into an eight bit byte signal thereby producing an 8 kilobyte per second digital signal.

[0026] In the above-referenced conventional system, the communication signal is processed in increments of 22.5 milliseconds. This results in 180 byte samples of the 8 kilobyte per second digital communication signal being processed in each successive frame of the radio telephone system channel. The time division multiplex frame for each channel pair is designed to accommodate a 14.6 kilobit per second encoded signal. For a given 22.5 millisecond frame, this is equivalent to 41 eight bit bytes of information per frame. Accordingly, for each frame, the information contained in the 180 byte samples must be encoded into no more than 41 bytes for transmission in one of the time slots of a selected frequency channel. Moreover, the encoded 41 bytes must, upon reception at the receiving station, be reconstructed into 180 byte samples for each frame without perceptible distortion or loss of information contained in the communication signal.

[0027] For voice transmissions, it is known to utilize a Residual Excited Linear Predictive encoding system (RELP) to process a 180 byte sample into a 41 byte encoded signal which is capable of being reconstructed into an acceptable equivalent 180 byte sample. The RELP encoding system relies upon the use of certain inherent pitch characteristics of a voice signal. Such an encoding system is referenced in U.S. Patent No. 4,675,863 and is described in detail in PCT International Publication No. WO 86/02726, published May 9, 1986, which patent application is hereby incorporated by reference as if fully set forth.

[0028] While RELP encoding has proven satisfactory for voice signals it is not entirely suitable for the encoding of fax (telecopy) and/or modem communication signals. These signals do not exhibit the harmonic and pitch characteristics of a voice signal. Accordingly, the underlying recursive algorithms upon which RELP is based do not adequately facilitate the encoding of such signals. Nevertheless, the hardware processors suitable for RELP data compression are suitable for the compression technique of the present invention. For example, the Texas Instrument Model TMS 32020 Digital Signal Processor is preferred for the implementation of the instant compression process.

[0029] In order to improve the transmission of fax and modem signals in such radio telephone communication systems, an improved coding technique and implementation system therefor has been devised. With reference to Figure 2, there is shown schematically applicant's inventive encoding and decoding system for communication signals, particularly fax and data signals.

[0030] The processing of the communication signal from its standard analog form into a digital 64 kilobits per second (8 kilobytes per second) digital signal for processing in 180 byte samples per frame is standardized with in the overall radio telecommunication system for the processing of all communication signals. When fax and/or data signals are being communicated, the 8 kilobyte per second digital signal 20 is encoded into a selectively formatted coded signal 21 by a coding processor 22. The coded signal 21 is transmitted in a selected time slot of one of the systems radio channels 24 which each contain several slots defined by time division multiplexing. The receiving station includes a decoding processor 25. The encoded signal 21 is directed to the decoder 25 for processing to reconstruct a communication signal 26 which is substantially equivalent to the original signal 20. Both the transmitting station and the receiving station include a compression selector processor 27, 28 which coordinates the respective encoding and/or decoding activity as discussed below with respect to Figure 7. In practice, each station includes both an encoder 22 and a decoder 25 for duplex station-station-communication. Moreover, the compression selector processor, encoder and decoder may all be implemented in a single micro processor such as a Texas Instrument Model TMS 32020 Digital Signal Processor.

[0031] The encoding processor 22 first interpolates the communication signal 20 by a selected factor M' to increase the sample size. The augmented sample is then split into its in-phase and quadrature components 30, 31 through the multiplication by the $\cos(\Omega t)$ and $\sin(\Omega t)$, respectively. This results in the simultaneous processing of two bit streams of information 30, 31. Ω is chosen as the approximate center frequency of the frequency domain representation of the signal. The mixing by $\cos(\Omega t)$ and $\sin(\Omega t)$ respectively, displaces the center of the frequency domain of the communication signal from Ω to 0Hz.

[0032] After mixing, each respective signal 30, 31 is low passed filtered to remove frequency components over a selected level in the frequency domain. This eliminates distortion and echo frequency components centered on even multiples of Ω.

[0033] Each filtered sample 32, 33 is then decimated by a selected factor M to reduce the sample size for quantization. The decimated signal 34, 35 for both the in-phase and quadrature components are then quantized into a selected number of levels with an adaptive pulse code modulator coder which results in quantized signal samples 36, 37 and a quantization gain component G. The respective quantized signal samples and gain component, along with a unique word 40, are then formatted into the encoded signal 21 which has a selected frame structure. Although separate gain components may be generated for the in-phase and quadratu re components, a common gain value of the most significant eight bits is

satisfactory for the compression of the 8 kilobyte per second signal into an encoded 14.6 kilobit per second signal.

[0034] The frame structure conforms with the format requirements of the slots allocated for communication signals in the time division multiplexed channels of the radio telephone system. In the preferred system, the frame format is 41 bytes per frame. The unique word 40 conveys the information relating to the type of signal being communicated, i.e. voice, fax, or modem, and timing information. In the receiver, the received encoded frame is processed in accordance with this information.

[0035] The decoding processor 25 of the receiving station separates the quantized signal samples 36, 37 and quantization gain G for the respective in-phase and quadrature components. Decoding of the quantized signals 36, 37 is then performed in accordance with the quantization gain parameter G resulting in communication signal samples 42, 43 which are informationally equivalent to the pre-quantized, decimated samples 34, 35. Thereafter the signal samples 42, 43 for both in-phase and quadrature components are successively interpolated by the factor M.

[0036] The interpolated in-phase signal 44 is then again mixed with $\cos(\Omega t)$ and the interpolated quadrature signal 45 is then again mixed with $\sin(\Omega t)$. Both signals 46, 47 are then low pass filtered at the same level for which filtering was conducted following the initial mixing of the signals. Each filtered signal 48, 49 is decimated by the factor M' and the two signals are summed to reconstruct a communication signal 26 equivalent to the initial 8 kilobyte signal 20. Although it is possible to synchronize the encoding and decoding processes, synchronization is not required.

[0037] In the preferred embodiment, compatible with the system disclosed in U.S. Patent 4,675,863, when encoding of the digitized 8 kilobyte per second communication signal 20, the encoding processor 22 encodes a 180 byte sample into a 41 byte frame structure for time division multiplex transmission over a selected radio telephone system channel.

[0038] As illustrated in Figure 3, split band modem communication signals are relatively narrowly centered about either 1200 hertz (representing data transmission from the originating modem) or 2400 hertz (representing data transmission from the answering modem). Fax communication signals are typically centered about 1800 hertz in a broader range as illustrated in Figure 4.

[0039] Preferably when a fax signal is being communicated, the signal is interpolated by a factor of three, thereby increasing the frame sample size to 540 samples per frame. Mixing is then effectuated for in-phase and quadrature components by cos(1800t) and sin(1800t), respectively. Low pass filtering is performed to eliminate frequencies higher than 1400 hertz. The respective in-phase and quadrature components 32, 33 are then decimated by a factor of 10 resulting in a reduction in a sample size to 54 samples for each component of the frame.

[0040] The in-phase and quadrature samples 34, 35 are then quantized into 6 levels with an adaptive pulse code modulation coder resulting in the quantized representation of the samples 36, 37 and a quantization gain factor G of 8 bits. The encoded quantized representations of the respective 54 byte samples per frame of each component are encoded into an eight bit bytes which each represent a group of three quantized signal samples. Thus the 54 samples of the respective components remaining after decimation are represented by 18 bytes which each represent quantized value of three of the 54 samples and the 8 bit gain factor G.

[0041] Accordingly a total of 36 eight bit bytes D1-D36 and the 8 bit gain factor G are formatted into a 41 byte frame for data transmission by the radio telecommunication system such as depicted in Figure 5. The 16 bit unique word U, a 4 bit error checking code C and 12 unused bits X fill out the frame to total the 41 bytes.

[0042] After the frame is transmitted and received over the carrier medium, the formatted frame is then decoded separating the 8 bit gain factor G and the 18 in-phase and 18 quadrature quantized bytes. The quantized signals 36, 37 are then respectively decoded in accordance with the quantization gain factor G resulting in 54 eight bit samples 42, 43 which contain information essentially equivalent to the prequantized, decimated in-phase and quadrature signals 34, 35, respectively.

[0043] The decoded in-phase and quadrature samples 42, 43, respectively, are then interpolated by a factor of 10 to increase the sample size to 540. The resulting signal 44 of the in-phase component is then mixed with cos (1800t). Similarly the quadrature component 45 is mixed with sin(1800t). The samples 46, 47 are then low pass filtered to remove frequency domain components above 1400 hertz. Thereafter, the resultant in-phase and quadrature components 48, 49 are each decimated by a factor of 3 to reduce the sample size to 180 eight bit samples in the frame. Finally, the signals 50, 51 are summed to produce a communication signal 26 which is substantially equivalent to the initial 8 kilobyte per second signal 20.

[0044] For modem transmission, the parameters used for data compression are slightly different. As with fax signals each 180 byte per frame digital signals is interpolated by a factor of 3 to increase the sample size to 540. The mixing of the signal into in-phase and quadrature components by $\cos(\Omega t)$ and $\sin(\Omega t)$, respectively is performed with Ω equal to either 1200 hertz or 2400 hertz depending upon whether the signal is emanating from the originating or answering modem.

[0045] Low pass filtering is applied with a cut off frequency of 700 hertz. The lower level of low pass filtering for modem signals, in comparison to fax signals, is due to the relatively narrow band width of the frequency domain of the modem signal about 1200 and 2400 hertz.

[0046] After filtering, the signal is decimated by a factor of 20 to reduce samples to 27 samples per frame. The respective in-phase quadrature samples are quantized into 32 levels with an adaptive PCM coder. This results in 27 five bit quantized representations D1-D54 of the

decimated samples for each of the respective in-phase and quadrature components along with an 8 bit quantization gain factor G. This information along with the 16 bit unique word U, a four bit error checking code C, and 12 unused bits X, is formatted into a 41 byte frame structure for transmission in the selected time slot of the selected frequency channel pair over which radio telecommunications is being conducted. Figure 6 represents the frame structure for such data communication. Note that preferably the unique word U is always formatted in the same position irrespective of signal type.

[0047] In the receiving end, the received 41 byte frame is separated into the respective 27 five bit quantized samples for the in-phase and quadrature components and 8 bit quantization gain G. The encoded five bit quantized samples are decoded in accordance with the quantization gain factor G to result in 27 eight bit signal samples which are informationally equivalent of the decimated in-phase and quadrature signal components, respectively. The decoded samples are interpolated by a factor of 20 to result in 540 samples per frame. These samples are again mixed with $\cos(\Omega t)$ and $\sin(\Omega t)$, respectively, and then low pass filtered using the same filter level (700 Hz) as in the transmitter. Thereafter the mixed and filtered decoded signals 48, 49 are decimated by a factor of 3 to result in 180 samples per frame. The two signals 50, 51 are then summed to produce the 8 kilobyte per second communication signal 26 which is informationally equivalent to the original signal 20.

[0048] The unique word 40 is utilized to indicate the type of signal being processed so that the system uses the appropriate compression method and associated parameters with the particular signal. For example the unique word will indicate whether the communication signal is to be processed as voice, fax, modem origination, or modem answer signals.

[0049] A prior art radio telecommunication system, such as described in U.S. Patent No. 4,675,863, can be readily modified to utilize the inventive compression method. Figure 7, schematically depicts the modification which entails the substitution of a compression selection processor (CSP) 60 and associated coding/decoding processors (CODECs) 61, 62, 63, 64 for each voice coder/decoder (CODEC) in the prior art system.

[0050] Generally, the CSP 60 utilizes only one of the CO-DEC's 61-64 at a time. Accordingly, all CODEC's may be embodied in a single microchip with the CSP controlling the parameters and method of encoding to be used for any given communication signal. In fact, all of the processors 60-64 can be integrated into a Texas Instrument Model TMS 32020 Digital Signal Processor to implement both the coding selection and the appropriate coding and decoding processes.

[0051] Preferably, in the compression processing of communication signals, the radio telecommunications system utilizes a desired voice signal compression method such as RELP, as a default state. This is preferred since a standard echo cancellor disable tone at either 2225 or 2100 Hz is generated at the initiation of fax and modem transmission.

[0052] The compression selection processor 60 monitors the communication signal 20, which is being processed by the voice CODEC 61, to check for an echo canceller disabled tone. This is done by checking the first two reflection coefficients of each frame. If these coefficients are in a specified range for a sufficient number of frames, the system switches from voice processing to processing the communication signal in accordance with the data compression technique of the present invention in the fax and modem CODECs 62-64.

[0053] After switching from the voice state, the system initially processes the communication signals with the fax CODEC 62 in accordance with the parameters for fax signal transmission discussed above. The communication signal 20 is then monitored to detect the presence of fax signaling. Specifically, the detection is performed by exploiting the presence of a 300 bit per second half duplex FSK signal (using 1650 and 1815 Hz) which is used for the initial hand shaking between fax machines.

[0054] The FSK signal is detected in the following way. A second order LPC analysis is performed on the signal which produces 2 reflection coefficients. Each reflection coefficient is averaged with the corresponding coefficient from the preceding 3 frames. If the average of the coefficients fall within the set of predetermined boundaries, fax transmission is detected and processing continues in accordance with the fax CODEC 62, i.e., with the above disclosed compression technique using fax parameters. If, however, the FSK signal is not detected within a designated window of time such as 4.725 seconds, the system begins to utilize the appropriate modem CODEC 63, 64.

[0055] Upon detection of the disabling tone and the absence of the FSK signal detection, the originating modem CODEC 63 is used. The unique word transmitted in each frame is processed by the receiving station to decode the frame as voice, fax, and modem originated or modem answer data respectively. When the receiving station detects reception of a unique word indicating an originating modem signal, the selection processor 60 of the receiving station switches to use the answering modem CODEC 64 for return signals.

[0056] In addition to monitoring the transmit direction communication signal 20 for fax signaling, the processor 60 also monitors the energy in the transmit direction. If energy disappears from the transmit direction for a predefined interval, such as 67.5 milliseconds for modem signals and 22.5 milliseconds for fax signals, the processor notes this and the system returns to its default state, processing the communication signal as a voice signal with the voice CODEC 61. Irrespective of whether the FSK signal is detected, the energy in the transmit direction is continually monitored to determine the end of fax and/or modem signaling to reset the system to voice signaling.

[0057] Although the present data compression method

has been described in conjunction with a specific radio telecommunication system in a presently preferred embodiment, it can be readily adapted to other systems where parameters, frequencies, carrier medium, frame timing and structure are varied. Additionally the parameters utilized in the data compression method have been determined with reference to compatibility with the systems disclosed in U.S. Patent 4,675,863. It is possible to formulate other sets of parameters which will effectively enable the compression of the communication signal in accordance with the disclosed invention which can be decoded into informationally equivalent data signals in accordance with the disclosed methods.

Claims

1. A method of communicating communication signals (20) of differing types between various locations (10, 11) over a selected carrier medium (24) of a telecommunication system, wherein the communication signal (20) is compressed to facilitate its transmission over the selected carrier medium (24) and the communication signal (20) is reconstructed after reception, said method comprising the steps of:

transforming the communication signal (20) into two separate components including:

determining the approximate center frequency Ω of the communication signal (20),
mixing the communication signal (20) with $\cos(\Omega t)$ to produce an in-phase signal component (30), and
mixing the communication signal (20) with $\sin(\Omega t)$ to produce a quadrature signal component (31); and
quantizing each of the separated in-phase and quadrature signal components (30, 31) thereby encoding the separated signal components (30, 31) into quantized in-phase and quadrature signals (36, 37) and an associated quantization gain parameter (G) to produce a compressed encoded signal (21) for transmission over the selected carrier medium (24) of the communication system,

characterized in that the method further comprises the step of including in the compressed encoded signal a unique word (U) to indicate the type of signal being communicated.

2. A method according to claim 1, further **characterized by**:

transmitting the compressed encoded signal (21) over the selected carrier medium (24) of the communication system and receiving said compressed encoded signal (21) at a receiving location;
separating the quantized in-phase and quadrature signals (36, 37) and gain component (G) of the compressed encoded signal (21) received over the selected carrier medium (24) of the communication system;
determining the approximate center frequency Ω' of the compressed encoded signal (21) being decoded;
reconstructing the quantized in-phase and quadrature signals (36, 37) by quantize decoding in accordance with the gain component (G) to produce reconstructed in-phase and quadrature signals (42, 43);
mixing the reconstructed in-phase signal (42) with $\cos(\Omega' t)$ to produce a mixed, reconstructed in-phase signal (46);
mixing the reconstructed quadrature signal (43) with $\sin(\Omega' t)$ to produce a mixed, reconstructed quadrature signal (47); and
summing the respective mixed, reconstructed in-phase and reconstructed quadrature signals (46, 47) to reproduce a decoded, decompressed communication signal (26).

3. A method according to claim 2, further **characterized by** filtering each of the separated in-phase and quadrature signal components (30, 31) prior to quantizing to remove from each component's frequency domain all frequencies above a selected level to produce respective filtered in-phase and quadrature components (32, 33), and by formatting the quantized in-phase and quadrature signals (36, 37) and gain component (G) to produce said compressed encoded signal (21) for transmission over the selected carrier medium (24) of the communication system.

4. A method according to claim 3, further **characterized by** decimating the respective filtered in-phase and quadrature components (32, 33) by a selected factor M prior to quantizing to produce respective decimated in-phase and quadrature components (34, 35).

5. A method according to claim 4, further **characterized by** interpolating the communication signal (20) by a selected factor M' prior to mixing the communication signal (20) with the $\cos(\Omega t)$ and the $\sin(\Omega t)$ to produce the respective separated in-phase and quadrature signal components (30, 31).

6. A method according to claim 5, further **characterized by** filtering the respective mixed, reconstructed in-phase and quadrature signals (46, 47) prior to summing to remove from each component's frequency domain all frequencies above said selected filtering level to produce respective filtered, recon-

structed in-phase and quadrature signals (48, 49).

7. A method according to claim 6, further **characterized by** interpolating the reconstructed in-phase and quadrature signals (42, 43) by a selected factor m prior to mixing.

8. A method according to claim 7, further **characterized by** decimating the respective filtered, reconstructed in-phase and quadrature signals (48, 49) by a selected factor m' prior to summing.

9. A method according to claim 8, further **characterized by** determining the approximate center frequency Ω of the communication signal (20), determining the type of communication signal and assigning preselected values for processing the communication signal (20) based upon the type of signal.

10. A method according to claim 9, further **characterized in that**:

the preselected value assigned to Ω is 1800 (Fig. 4), M is selected to be 10, M' is selected to be 3, the filtering level is selected to be 1400 Hz and the respective decimated in-phase and quadrature components (34, 35) are quantized into 6 levels when the communication signal (20) is determined to be a fax signal; or
the preselected value assigned to Ω is 1200 (Fig. 3), M is selected to be 20, M' is selected to be 3, the filtering level is selected to be 700 Hz and the respective decimated in-phase and quadrature components (34, 35) are quantized into 32 levels when the communication signal (20) is determined to be an originating band signal of a split band modem signal; or
the preselected value assigned to Ω is 2400 (Fig. 3), M is selected to be 20, M' is selected to be 3, the filtering level is selected to be 700 Hz and the respective decimated in-phase and quadrature components (34, 35) are quantized into 32 levels when the communication signal (20) is determined to be an answering band signal of a split band modem signal; or
the preselected value assigned to Ω' is 1800 (Fig. 4), m is selected to be 10, m' is selected to be 3 and the filtering level is selected to be 1400 Hz when said compressed encoded signal (21) corresponding to said communication signal (20) is determined to be a fax signal and is received at said receiving location; or
the preselected value assigned to Ω' is 1200 (Fig. 3), m is selected to be 20, m' is selected to be 3 and the filtering level is selected to be 700 Hz when said compressed encoded signal (21) corresponding to said communication signal (20) is determined to be an originating band signal of a split band modem signal and is received at said receiving location; or
the preselected value assigned to Ω' is 2400 (Fig. 3), m is selected to be 20, m' is selected to be 3 and the filtering level is selected to be 700 Hz when said compressed encoded signal (21) corresponding to said communication signal (20) is determined to be an answering band signal of a split band modem signal and is received at said receiving location.

11. A telecommunication system for communicating communication signals (20) of differing types between various locations (10, 11) over a selected carrier medium (24) wherein the communication signal (20) is compressed to facilitate its transmission over the selected carrier medium (24) and said communication signal (21) is reconstructed after reception; said telecommunication system comprising a signal compression encoder (22), wherein said encoder (22) comprises:

means for transforming a communication signal into two separate components including:

means for determining (27) the approximate center frequency Ω of the communication signal (20),
means for mixing the communication signal (20) with cos(Ωt) to produce an in-phase signal component (30), and
means for mixing the communication signal (20) with sin(Ωt) to produce a quadrature signal component (31); and
means for quantizing each of the separated in-phase and quadrature signal components (30, 31) thereby encoding the separated in-phase and quadrature signal components (30, 31) into quantized in-phase and quadrature signals (36, 37) and an associated quantization gain parameter (G) to produce a compressed encoded signal (21) for transmission over the selected carrier medium (24) of the communication system,

characterized in that said encoder further comprises means for inserting a unique word (U) into the compressed encoded signal (21) to indicate the type of signal being communicated.

12. A system according to claim 11, further **characterized in that** said encoder (22) includes: means for filtering each of the separated in-phase and quadrature signal components (30, 31) prior to quantizing to remove from each component's frequency domain all frequencies above a selected level to thereby produce respective filtered in-phase and quadrature components (32, 33); and formatting means for mul-

tiplexing the quantized in-phase and quadrature signals (36, 37) and gain component (G) to thereby produce said compressed encoded signal (21) for transmission over the selected carrier medium (24) of the communication system.

13. A system according to claim 12, further **characterized in that** said encoder (22) includes means for decimating the respective filtered in-phase and quadrature components (32, 33) by a selected factor M prior to quantizing.

14. A system according to claim 13, further **characterized in that** said encoder (22) includes means for interpolating the communication signal (20) by a selected factor M' prior to mixing the communication signal (20) with the cos(Ωt) and the sin(Ωt)to produce the separated in-phase and quadrature signal components (30, 31).

15. A system according to claim 14, **characterized in that** said means for determining (27) the approximate center frequency Ω of the communication signal (20) determines the type of communication signal and assigns preselected values to Ω, M, M', the level of filtering and the number of quantization levels based upon the type of signal.

16. A system according to one or more of claims 11-15, **characterized by** further including:

a signal decompression decoder (25) comprising:

format decoding means for separating the quantized in-phase and quadrature signals (36, 37) and gain component (G) of said compressed encoded signal (21) received over the selected carrier medium (24) of the communication system; means for determining (28) the approximate center frequency Ω' of the compressed encoded signal (21) being decoded;
quantize decoding means for reconstructing the in-phase and quadrature signals (36, 37) in accordance with the gain component (G) to produce reconstructed in-phase and quadrature signals (42, 43);
means for mixing the reconstructed in-phase signal (42) with cos(Ω't) to produce a mixed, reconstructed signal in-phase (46);
means for mixing the reconstructed quadrature signal (43) with sin(Ω't) to produce a mixed, reconstructed quadrature signal (47); and
means for summing said respective mixed, reconstructed in-phase and quadrature signals (46, 47) to reproduce a decoded, decompressed communication signal (26).

17. A system according to claim 16, further **characterized by** a first communication station (10) having said compression encoder (22) and a second communication station (11) for receiving the compressed encoded signal (21) from said first station (10) having said signal decompression decoder (25).

18. A system according to claim 16, further **characterized by** a plurality of communication stations (10, 11) each including at least one of said signal compression encoders (22) and at least one of said signal decompression decoders (25).

19. A system according to claim 18, further **characterized by** at least one of said communication stations (10) including:

a plurality of said signal compression encoders (22) and a plurality of said signal decompression decoders (25) for encoding and decoding a selected type of signal;
means for selecting one of said plurality of encoders (22) for processing a signal (20) to be transmitted in accordance with the signal type; and
means for selecting one of said plurality of decoders (25) for processing a received signal (21) in accordance with the signal type.

20. A system according to any one of claims 16 to 19, **characterized in that** said means for determining (28) the approximate center frequency Ω' of the compressed encoded signal (21) determines the type of communication signal and assigns a preselected value to Ω' based upon the type of signal.

21. A system according to any one of claims 16 to 19, **characterized in that**:

each signal compression encoder (22) further includes means for filtering each of the separated in-phase and quadrature signal components (30, 31) prior to quantizing to remove from each component's frequency domain all frequencies above a selected level; and **in that** each signal decompression decoder (25) further includes means for filtering the respective mixed, reconstructed in-phase and quadrature signals (46, 47) prior to summing to remove from each component's frequency domain all frequencies above a selected filtering level to produce respective filtered, reconstructed in-phase and quadrature signals (48, 49).

22. A system according to claim 21, **characterized in that**:

each signal compression encoder (22) further includes means for decimating the respective filtered in-phase and quadrature components (32, 33) by a selected factor M prior to quantizing to produce respective decimated in-phase and quadrature components (34, 35); and **in that** each signal decompression decoder (25) further includes means for interpolating the reconstructed in-phase and quadrature signals (42, 43) by a selected factor m prior to mixing.

23. A system according to claim 22, **characterized in that**:

each signal compression encoder (22) further includes means for interpolating the communication signal (20) by a selected factor M' prior to mixing the communication signal (20) with the cos(Ωt) and the sin(Ωt) to produce the respective separated in-phase and quadrature signal components (30, 31); and
each signal decompression decoder (25) further includes means for decimating the respective filtered, reconstructed in-phase and quadrature signals (48, 49) by a selected factor m' prior to summing.

24. A system according to claim 23, **characterized in that**:

said encoder (22) includes means for determining (27) the type of communication signal and assigns to each encoder (22) preselected values for Ω, M, M', the level of filtering and the number of quantization levels based upon the type of signal (20); and
said decoder (25) includes means for determining (28) the type of communication signal and assigns to each decoder preselected values for Ω', m, m', the level of filtering and the number of quantization levels based upon the type of signal.

25. A system according to claim 24, **characterized in that**:

the preselected value assigned to Ω is 1800 (Fig. 4), M is selected to be 10, M' is selected to be 3, the filtering level is selected to be 1400 Hz and the respective decimated in-phase and quadrature components (34, 35) are quantized into 6 levels when the communication signal (20) is determined to be a fax signal; or
the preselected value assigned to Ω is 1200 (Fig. 3), M is selected to be 20, M' is selected to be 3, the filtering level is selected to be 700 Hz and the respective decimated in-phase and quadrature components (34, 35) are quantized into 32 levels when the communication signal (20) is determined to be an originating band signal of a split band modem signal; or
the preselected value assigned to Ω is 2400 (Fig. 3), M is selected to be 20, M' is selected to be 3, the filtering level is selected to be 700 Hz and the respective decimated in-phase and quadrature components (34, 35) are quantized into 32 levels when the communication signal (20) is determined to be an answering band signal of a split band modem signal; or
the preselected value assigned to Ω' is 1800 (Fig. 4), m is selected to be 10, m' is selected to be 3 and the filtering level is selected to be 1400 Hz when said compressed encoded signal (21) corresponding to said communication signal (20) is determined to be a fax signal and is received at a receiving location; or
the preselected value assigned to Ω' is 1200 (Fig. 3), m is selected to be 20, m' is selected to be 3 and the filtering level is selected to be 700 Hz when said compressed encoded signal (21) corresponding to said communication signal (20) is determined to be an originating band signal of a split band modem signal and is received at a receiving location; or
the preselected value assigned to Ω' is 2400 (Fig. 3), m is selected to be 20, m' is selected to be 3 and the filtering level is selected to be 700 Hz when said compressed encoded signal (21) corresponding to said communication signal (20) is determined to be an answering band signal of a split band modem signal and is received at a receiving location.

26. A system according to claim 25, **characterized in that** said means for determining (27) the approximate center frequency Ω of the communication signal (20) determines the type of communication signal.

Patentansprüche

1. Verfahren zum Übertragen von Kommunikationssignalen (20) unterschiedlicher Typen zwischen verschiedenen Stellen (10, 11) über ein ausgewähltes Trägermedium (24) eines Telekommunikationssystems, wobei das Kommunikationssignal (20) komprimiert wird, um seine Übertragung über das ausgewählte Trägermedium (24) zu erleichtern, und das Kommunikationssignal (20) nach dem Empfang rekonstruiert wird, wobei das Verfahren die folgenden Schritte umfasst:

- Umwandeln des Kommunikationssignals (20) in zwei getrennte Komponenten, einschließlich:
- Bestimmen der annähernden Mittenfrequenz

Ω des Kommunikationssignals (20),
- Mischen des Kommunikationssignals (20) mit cos(Ωt) zum Erzeugen einer phasengleichen Signalkomponente (30), und
- Mischen des Kommunikationssignals (20) mit sin(Ωt) zum Erzeugen einer Quadratur-Signalkomponente (31); und
- Quantisieren einer jeden getrennten phasengleichen und Quadratur-Signalkomponente (30, 31), wodurch die getrennten Signalkomponenten (30, 31) in ein quantisiertes phasengleiches und ein quantisiertes Quadratur-Signal (36, 37) sowie einen damit verbundenen Quantisierungs-Verstärkungs-Parameter (G) codiert werden, um ein komprimiertes codiertes Signal (21) zur Übertragung über das ausgewählte Trägermedium (24) des Kommunikationssystems zu erzeugen,

dadurch gekennzeichnet, dass das Verfahren ferner den Schritt des Einfügens eines einzigartigen Worts (U) in das komprimierte codierte Signal zum Angeben des Typs des übermittelt werdenden Signals umfasst.

2. Ein Verfahren nach Anspruch 1, das weiterhin **gekennzeichnet ist durch**:

die Übertragung des komprimierten codierten Signals (21) über das ausgewählte Trägermedium (24) des Kommunikationssystems und der Empfang des komprimierten codierten Signals (21) in einer Empfangsstelle;
die Trennung der quantisierten Gleichphasen- und Quadratur-Signale (36, 36) und der Verstärkung-Komponente (G) des komprimierten codierten Signals (21), das über das ausgewählte Trägermedium (24) des Kommunikationssystems empfangen wird;
die Bestimmung der annähernden Mittenfrequenz Ω' des komprimierten codierten Signals (21), das decodiert wird;
die Rekonstruktion der quantisierten Gleichphasen- und Quadratur-Signale (36, 37) **durch** Quantisierungs-Decodierung in Übereinstimmung mit der Verstärkungs-Komponente (G), um rekonstruierte Gleichphasen- und Quadratur-Signale (42, 43) zu erzeugen;
die Mischung des rekonstruierten Gleichphasen-Signals (42) mit cos(Ω't), um ein gemischtes rekonstruiertes Gleichphasen-Signal (46) zu erzeugen;
die Mischung des rekonstruierten Quadratur-Signals (43) mit sin(Ω't), um ein gemischtes rekonstruiertes Quadratur-Signal (47) zu erzeugen; und
die Summierung der jeweiligen gemischten rekonstruierten Gleichphasen- und rekonstruierten Quadratur-Signale (46, 47), um ein decodiertes dekomprimiertes Kommunikationssignal (26) zu rekonstruieren.

3. Ein Verfahren nach Anspruch 2, weiterhin **gekennzeichnet durch** das Filtern aller getrennter Gleichphasen- und Quadratur-Signalkomponenten (30, 31), bevor quantisiert wird, um aus jedem Frequenzbereich der Komponente alle Frequenzen oberhalb eines ausgewählten Pegels zu entfernen, um eine jeweilige gefilterte Gleichphasen- und Quadratur-Komponente (32, 33) zu erzeugen, und **durch** das Formatieren der quantisierten Gleichphasen- und Quadratur-Signale (36, 37) und der Verstärkungs-Komponente (G), um das komprimierte codierte Signal (21) zur Übertragung über das ausgewählte Trägermedium (24) des Kommunikationssystems zu erzeugen.

4. Ein Verfahren nach Anspruch 3, weiterhin **gekennzeichnet durch** die Dezimierung der jeweiligen gefilterten Gleichphasen- und Quadratur-Komponente (32, 33) **durch** einen ausgewählten Faktor M, bevor quantisiert wird, um die jeweilige dezimierte Gleichphasen- und Quadratur-Komponente (34, 35) zu erzeugen.

5. Ein Verfahren nach Anspruch 4, weiterhin **gekennzeichnet durch** das Interpolieren des Kommunikationssignals (20) **durch** einen ausgewählten Faktor M', bevor das Kommunikationssignal (20) mit dem cos(Ωt) und dem sin(Ωt) gemischt wird, um die jeweilige getrennte Gleichphasen- und Quadratur-Signalkomponente (30, 31) zu erzeugen.

6. Ein Verfahren nach Anspruch 5, weiterhin **gekennzeichnet durch** das Filtern der jeweiligen vermischten rekonstruierten Gleichphasen- und Quadratur-Signale (46, 47), bevor summiert wird, um aus einem Frequenzbereich einer jeden Komponente alle Frequenzen oberhalb des ausgewählten Filterungs-Pegels zu entfernen, um die jeweilige gefilterte rekonstruierte Gleichphasen- und Quadratur-Signale (48, 49) zu erzeugen.

7. Ein Verfahren nach Anspruch 6, weiterhin **gekennzeichnet durch** das Interpolieren der rekonstruierten Gleichphasen- und Quadratur-Signale (42, 43) **durch** einen ausgewählten Faktor m vor der Mischung.

8. Ein Verfahren nach Anspruch 7, weiterhin **gekennzeichnet durch** die Dezimierung der jeweiligen gefilterten rekonstruierten Gleichphasen- und Quadratur-Signale (48, 49) **durch** einen ausgewählten Faktor m' vor der Summierung.

9. Ein Verfahren nach Anspruch 8, weiterhin **gekenn-**

zeichnet durch die Bestimmung der annähernden Mittenfrequenz Ω des Kommunikationssignals (20), **durch** die Bestimmung der Art des Kommunikationssignals, und **durch** die Zuordnung vorbestimmter Werte zur Verarbeitung des Kommunikationssignals (20) auf der Grundlage der Signalart.

10. Ein Verfahren nach Anspruch 9, das weiterhin **dadurch gekennzeichnet ist, daß**:

der vorbestimmte Ω zugeordnete Wert 1800 ist (Fig.4), M ausgewählt ist, um 10 zu sein, M' ausgewählt ist, um 3 zu sein, der Filterungs-Pegel ausgewählt ist, um 1400 Hz zu sein, und die jeweilige dezimierte Gleichphasen- und Quadratur-Komponente (34, 35) in 6 Stufen quantisiert werden, wenn bestimmt wird, daß das Kommunikationssignal (20) ein Fax-Signal ist; oder

der vorbestimmte Ω zugeordnete Wert 1200 ist (Fig.3), M ausgewählt ist, um 20 zu sein, M' ausgewählt ist, um 3 zu sein, der Filterungs-Pegel ausgewählt ist, um 700 Hz zu sein, und die jeweilige dezimierte Gleichphasen- und Quadratur-Komponente (34, 35) in 32 Stufen quantisiert werden, wenn bestimmt wird, daß das Kommunikationssignal (20) ein Ursprungs-Bandsignal eines Zwei-Band-Modem-Signals ist; oder

der vorbestimmte Ω zugeordnete Wert 2400 ist (Fig.3), M ausgewählt ist, um 20 zu sein, M' ausgewählt ist, um 3 zu sein, der Filterungs-Pegel ausgewählt ist, um 700 Hz zu sein, und die jeweilige dezimierte Gleichphasen- und Quadratur-Komponente (34, 35) in 32 Stufen quantisiert werden, wenn bestimmt wird, daß das Kommunikationssignal (20) ein Antwort-Bandsignal eines Zwei-Band-Modem-Signals ist; oder

der vorbestimmte Ω' zugeordnete Wert 1800 ist (Fig.4), m ausgewählt ist, um 10 zu sein, m' ausgewählt ist, um 3 zu sein, und der Filterungs-Pegel ausgewählt ist, um 1400 Hz zu sein, wenn bestimmt wird, daß das komprimierte codierte Signal (21), das dem Kommunikationssignal (20) entspricht, ein Fax-Signal ist und an einer Empfangsstelle empfangen wird; oder

der vorbestimmte Ω' zugeordnete Wert 1200 ist (Fig.3), m ausgewählt ist, um 20 zu sein, m' ausgewählt ist, um 3 zu sein, und der Filterungs-Pegel ausgewählt ist, um 700 Hz zu sein, wenn bestimmt wird, daß das komprimierte codierte Signal (21), das dem Kommunikationssignal (20) entspricht, ein Ursprungs-Bandsignal eines Zwei-Band-Modem-Signals ist und an einer Empfangsstelle empfangen wird; oder

der vorbestimmte Ω' zugeordnete Wert 2400 ist (Fig.3), m ausgewählt ist, um 20 zu sein, m' ausgewählt ist, um 3 zu sein, und der Filterungs-Pegel ausgewählt ist, um 700 Hz zu sein, wenn bestimmt wird, daß das komprimierte codierte Signal (21), das dem Kommunikationssignal (20) entspricht, ein Antwort-Bandsignal eines Zwei-Band-Modem-Signals ist und an einer Empfangsstelle empfangen wird.

11. Telekommunikationssystem zur Übertragung von Kommunikationssignalen (20) unterschiedlicher Typen zwischen verschiedenen Stellen (10, 11) über ein ausgewähltes Trägermedium (24), wobei das Kommunikationssignal (20) komprimiert wird, um seine Übertragung über das ausgewählte Trägermedium (24) zu erleichtern, und das Kommunikationssignal (21) nach dem Empfang rekonstruiert wird; wobei das Telekommunikationssystem einen Signal-Kompressions-Codierer (22) umfasst, wobei der Codierer (22) umfasst:

- ein Mittel zur Umwandlung eines Kommunikationssignals in zwei getrennte Komponenten, einschließlich:
- einem Mittel (27) zur Bestimmung der annähernden Mittenfrequenz Ω des Kommunikationssignals (20),
- einem Mittel zur Mischung des Kommunikationssignals (20) mit cos(Ωt), um eine phasengleiche Signalkomponente (30) zu erzeugen, und
- einem Mittel zur Mischung des Kommunikationssignals (20) mit sin(Ωt), um eine Quadratur-Signalkomponente (31) zu erzeugen; und
- ein Mittel zur Quantisierung einer jeden getrennten phasengleichen und Quadratur-Signalkomponente (30, 31), wodurch die getrennten Signalkomponenten (30, 31) in ein quantisiertes phasengleiches und ein quantisiertes Quadratur-Signal (36, 37) sowie einen damit verbundenen Quantisierungs-Verstärkungs-Parameter (G) codiert werden, um ein komprimiertes codiertes Signal (21) zur Übertragung über das ausgewählte Trägermedium (24) des Kommunikationssystems zu erzeugen,
- **dadurch gekennzeichnet, dass** der Codierer ferner Mittel zum Einfügen eines einzigartigen Worts (U) in das komprimierte codierte Signal (21) zum Angeben des Typs des übermittelt werdenden Signals umfasst.

12. Ein System nach Anspruch 11, das weiterhin **dadurch gekennzeichnet ist, daß** der Codierer (22) einschließt: ein Mittel zum Filtern einer jeden getrennten Gleichphasen- und Quadratur-Signalkomponente (30, 31) vor der Quantisierung, um aus einem Frequenzbereich einer jeden Komponente alle Frequenzen oberhalb eines ausgewählten Pegels zu entfernen, um **dadurch** eine jeweilige gefilterte Gleichphasen- und Quadratur-Komponente (32, 33) zu erzeugen; und ein Formatiermittel zum Multiple-

xen der quantisierten Gleichphasen- und Quadratur-Signale (36, 37) und der Verstärkungs-Komponente (G), um **dadurch** das komprimierte codierte Signal (21) zur Übertragung über das ausgewählte Trägermedium (24) des Kommunikationssystems zu erzeugen.

13. Ein System nach Anspruch 12, das weiterhin **dadurch gekennzeichnet ist, daß** der Codierer (22) ein Mittel zur Dezimierung der jeweiligen gefilterten Gleichphasen- und Quadratur-Komponente (32, 33) durch einen ausgewählten Faktor M vor der Quantisierung einschließt.

14. Ein System nach Anspruch 13, das weiterhin **dadurch gekennzeichnet ist, daß** der Codierer (22) ein Mittel zum Interpolieren des Kommunikationssignals (20) durch einen ausgewählten Faktor M' einschließt, bevor das Kommunikationssignal (20) mit dem cos(Ωt) und dem sin(Ωt) gemischt wird, um getrennte Gleichphasen- und Quadratur-Signalkomponente (30, 31) zu erzeugen.

15. Ein System nach Anspruch 14, **dadurch gekennzeichnet, daß** das Mittel (27) zur Bestimmung der annähernden Mittenfrequenz Ω des Kommunikationssignals (20) die Art des Kommunikationssignals bestimmt und Ω, M, M' vorgewählte Werte zuordnet, wobei der Filterungs-Pegel und die Anzahl der Quantisierungsstufen auf der Signalart basieren.

16. Ein System nach einem oder mehreren der Ansprüche 11-15, weiterhin **gekennzeichnet**, daß es folgendes einschließt:

einen Signal-Dekompressions-Decodierer (25), der umfaßt:

ein Format-Decodierungsmittel zur Trennung der quantisierten Gleichphasen- und Quadratur-Signale (36, 37) und der Verstärkungs-Komponente (G) des komprimierten codierten Signals (21), das über das ausgewählte Trägermedium (24) des Kommunikationssystems empfangen wird; ein Mittel (28) zur Bestimmung der annähernden Mittenfrequenz Ω' des komprimierten codierten Signals (21), das decodiert wird;
ein Quantisierungs-Decodierungsmittel zur Rekonstruktion der Gleichphasen- und Quadratur-Signale (36, 37) in Übereinstimmung mit der Verstärkungs-Komponente (G), um rekonstruierte Gleichphasen- und Quadratur-Signale (42, 43) zu erzeugen;
ein Mittel zur Mischung des rekonstruierten Gleichphasen-Signals (42) mit cos(Ω't), um ein gemischtes rekonstruiertes Gleichphasen-Signal (46) zu erzeugen;
ein Mittel zur Mischung des rekonstruierten Quadratur-Signals (43) mit sin(Ω't), um ein vermischtes rekonstruiertes Quadratur-Signal (47) zu erzeugen; und
ein Mittel zur Summierung des jeweiligen vermischten rekonstruierten Gleichphasen- und Quadratur-Signals (46, 47), um ein decodiertes dekomprimiertes Kommunikationssignal (26) zu rekonstruieren.

17. Ein System nach Anspruch 16, weiterhin **gekennzeichnet durch** eine erste Kommunikationsstation (10), die den Kompressions-Codierer (22) aufweist, und **durch** eine zweite Kommunikationsstation (11) zum Empfang des komprimierten codierten Signals (21) aus der ersten Station (10), die den Signal-Dekompressions-Decodierer (25) aufweist.

18. Ein System nach Anspruch 16, weiterhin **gekennzeichnet durch** eine Mehrzahl von Kommunikationsstationen (10, 11) **gekennzeichnet** ist, die jede mindestens einen der Signal-Kompressions-Codierer (22) und mindestens einen der Signal-Dekompressions-Decodierer (25) aufweist.

19. Ein System nach Anspruch 18, weiterhin **dadurch gekennzeichnet, daß** mindestens eine der Kommunikationsstationen (10) folgendes umfaßt:

eine Mehrzahl der Signal-Kompressions-Codierer (22) und einer Mehrzahl der Signal-Dekompressions-Decodierer (25) zum Codieren und Decodieren einer ausgewählten Signalart;
ein Mittel zum Auswählen eines der Mehrzahl der Codierer (22) zur Verarbeitung eines zu sendenden Signals (20) in Übereinstimmung mit der Signalart; und
ein Mittel zum Auswählen eines der Mehrzahl der Decodierer (25) zur Verarbeitung eines empfangenen Signals (21) in Übereinstimmung mit der Signalart.

20. Ein System nach irgendeinem der Ansprüche 16 bis 19, **dadurch gekennzeichnet, daß** das Mittel (28) zur Bestimmung der annähernden Mittenfrequenz Ω' des komprimierten codierten Signals (21) die Art des Kommunikationssignals bestimmt und Ω' einen vorbestimmten Wert auf der Grundlage der Signalart zuordnet.

21. Ein System nach irgendeinem der Ansprüche 16 bis 19, **dadurch gekennzeichnet, daß**:

jeder Signal-Kompressions-Codierer (22) weiterhin ein Mittel zum Filtern einer jeden der getrennten Gleichphasen- und Quadratur-Signalkomponente (30, 31) einschließt, bevor quantisiert wird, um aus dem Frequenzbereich einer

jeden Komponente alle Frequenzen oberhalb eines ausgewählten Pegels zu entfernen; und **dadurch**, daß
jeder Signal-Dekompressions-Decodierer (25) weiterhin ein Mittel zum Filtern des jeweiligen vermischten rekonstruierten Gleichphasen- und Quadratur-Signale (46, 47) einschließt, bevor summiert wird, um aus dem Frequenzbereich einer jeden Komponente alle Frequenzen oberhalb eines ausgewählten Filterungs-Pegels zu entfernen, um jeweilige gefilterte rekonstruierte Gleichphasen- und Quadratur-Signale (48, 49) zu erzeugen.

22. Ein System nach Anspruch 21, **dadurch gekennzeichnet, daß**:

jeder Signal-Kompressions-Codierer (22) weiterhin ein Mittel zum Dezimieren der jeweiligen gefilterten Gleichphasen- und Quadratur-Komponente (32, 33) durch einen ausgewählten Faktor M einschließt, bevor quantisiert wird, um eine jeweilige dezimierte Gleichphasen- und Quadratur-Komponente (34, 35) zu erzeugen; und **dadurch**, daß
jeder Signal-Dekompressions-Decodierer (25) weiterhin ein Mittel zum Interpolieren der rekonstruierten Gleichphasen- und Quadratur-Signale (42, 43) durch einen ausgewählten Faktor m vor der Mischung einschließt.

23. Ein System nach Anspruch 22, **dadurch gekennzeichnet, daß**:

jeder Signal-Kompressions-Codierer (22) weiterhin ein Mittel zum Interpolieren des Kommunikationssignals (20) durch einen ausgewählten Faktor M' einschließt, bevor das Kommunikationssignal (20) mit dem cos(Ωt) und dem sin(Ωt) gemischt wird, um die jeweilige getrennte Gleichphasen- und Quadratur-Signalkomponente (30, 31) zu erzeugen; und
jeder Signal-Dekompressions-Decodierer (25) weiterhin ein Mittel zur Dezimierung der jeweiligen gefilterten rekonstruierten Gleichphasen- und Quadratur-Signale (48, 49) durch einen ausgewählten Faktor m' einschließt, bevor summiert wird.

24. Ein System nach Anspruch 23, **dadurch gekennzeichnet, daß**:

der Codierer (22) ein Mittel (27) zur Bestimmung der Art des Kommunikationssignals einschließt und jedem Codierer (22) vorbestimmte Werte für Ω', m, m' zuordnet, wobei der Filterungs-Pegel und die Anzahl der Quantisierungsstufen auf der Signalart (20) basieren; und
der Decodierer (25) ein Mittel (28) zur Bestimmung der Art des Kommunikationssignals einschließt und jedem Decodierer vorbestimmte Werte für Ω', m, m' zuordnet, wobei der Filterungs-Pegel und die Anzahl der Quantisierungsstufen auf der Signalart basieren.

25. Ein System nach Anspruch 24, **dadurch gekennzeichnet, daß**:

der vorbestimmte Ω zugeordnete Wert 1800 ist (Fig.4), M ausgewählt ist, um 10 zu sein, M' ausgewählt ist, um 3 zu sein, der Filterungs-Pegel ausgewählt ist, um 1400 Hz zu sein, und die jeweilige dezimierte Gleichphasen- und Quadratur-Komponente (34, 35) in 6 Stufen quantisiert werden, wenn bestimmt wird, daß das Kommunikationssignal (20) ein Fax-Signal ist; oder
der vorbestimmte Ω zugeordnete Wert 1200 ist (Fig.3), M ausgewählt ist, um 20 zu sein, M' ausgewählt ist, um 3 zu sein, der Filterungs-Pegel ausgewählt ist, um 700 Hz zu sein, und die jeweilige dezimierte Gleichphasen- und Quadratur-Komponente (34, 35) in 32 Stufen quantisiert werden, wenn bestimmt wird, daß das Kommunikationssignal (20) ein Ursprungs-Bandsignal eines Zwei-Band-Modem-Signals ist; oder
der vorbestimmte Ω zugeordnete Wert 2400 ist (Fig.3), M ausgewählt ist, um 20 zu sein, M' ausgewählt ist, um 3 zu sein, der Filterungs-Pegel ausgewählt ist, um 700 Hz zu sein, und die jeweilige dezimierte Gleichphasen- und Quadratur-Komponente (34, 35) in 32 Stufen quantisiert werden, wenn bestimmt wird, daß das Kommunikationssignal (20) ein Antwort-Bandsignal eines Zwei-Band-Modem-Signals ist; oder
der vorbestimmte Ω' zugeordnete Wert 1800 ist (Fig.4), m ausgewählt ist, um 10 zu sein, m' ausgewählt ist, um 3 zu sein, und der Filterungs-Pegel ausgewählt ist, um 1400 Hz zu sein, wenn bestimmt wird, daß das komprimierte codierte Signal (21), das dem Kommunikationssignal (20) entspricht, ein Fax-Signal ist und an einer Empfangsstelle empfangen wird; oder
der vorbestimmte Ω' zugeordnete Wert 1200 ist (Fig.3), m ausgewählt ist, um 20 zu sein, m' ausgewählt ist, um 3 zu sein, und der Filterungs-Pegel ausgewählt ist, um 700 Hz zu sein, wenn bestimmt wird, daß das komprimierte codierte Signal (21), das dem Kommunikationssignal (20) entspricht, ein Ursprungs-Bandsignal eines Zwei-Band-Modem-Signals ist und an einer Empfangsstelle empfangen wird; oder
der vorbestimmte Ω' zugeordnete Wert 2400 ist (Fig.3), m ausgewählt ist, um 20 zu sein, m' ausgewählt ist, um 3 zu sein, und der Filterungs-Pegel ausgewählt ist, um 700 Hz zu sein, wenn

bestimmt wird, daß das komprimierte codierte Signal (21), das dem Kommunikationssignal (20) entspricht, ein Antwort-Bandsignal eines Zwei-Band-Modem-Signals ist und an einer Empfangsstelle empfangen wird.

26. Ein System nach Anspruch 25, **dadurch gekennzeichnet, daß** das Mittel (27) zur Bestimmung der annähernden Mittenfrequenz Ω des Kommunikationssignals (20) die Art des Kommunikationssignals bestimmt.

Revendications

1. Procédé de communication de signaux de communication (20) de différents types entre divers emplacements (10, 11) par l'intermédiaire d'un support (24) sélectionné d'un système de télécommunication, dans lequel le signal de communication (20) est comprimé pour faciliter sa transmission sur le support (24) sélectionné, et le signal de communication (20) est reconstruit après réception, ledit procédé comprenant les étapes consistant à :

transformer le signal de communication (20) en deux composantes séparées, comprenant :

la détermination de la fréquence centrale approchée Ω du signal de communication (20),
le mixage du signal de communication (20) avec cos(Ωt) pour produire une composante en phase (30) du signal, et
le mixage du signal de communication (20) avec sin(Ωt) pour produire une composante en quadrature (31) du signal ; et

quantifier chacune des composantes séparées (30, 31), en phase et en quadrature, pour ainsi coder les composantes séparées (30, 31) du signal en signaux en phase et en quadrature quantifiés (36, 37) et en un paramètre de gain de quantification (G) associé, pour produire un signal codé comprimé (21) à transmettre sur le support sélectionné (24) du système de communication, **caractérisé en ce que** le procédé comprend en outre l'étape consistant à inclure dans le signal codé comprimé un mot unique (V) pour indiquer le type de signal communiqué.

2. Procédé selon la revendication 1, **caractérisé en outre par** les étapes consistant à:

transmettre le signal codé comprimé (21) sur le support sélectionné (24) du système de communication, et recevoir ledit signal codé comprimé (21) à un emplacement de réception;

séparer les signaux en phase et en quadrature quantifiés (36, 37) et la composante de gain (G) du signal codé comprimé (21) reçu sur le support sélectionné (24) du système de communication;
déterminer la fréquence centrale approchée, Ω', du signal codé comprimé (21) en cours de décodage;
reconstruire les signaux en phase et en quadrature quantifiés (36, 37) par décodage quantifié, en accord avec la composante de gain (G), pour produire des signaux en phase et en quadrature reconstruits (42, 43);
mixer le signal en phase reconstruit (42) avec cos(Ω't), pour produire un signal en phase reconstruit mixé (46);
mixer le signal en quadrature reconstruit (43) avec sin(Ω't) pour produire un signal en quadrature reconstruit mixé (47); et
additionner les signaux en phase et en quadrature reconstruits mixés (46, 47) correspondants, pour reproduire un signal de communication décomprimé décodé (26).

3. Procédé selon la revendication 2, **caractérisé en outre par** l'étape consistant à filtrer, avant la quantification, chacune des composantes en phase et en quadrature séparées (30, 31), pour extraire du domaine de fréquences de chaque composante toutes les fréquences situées au-dessus d'un niveau sélectionné, pour produire des composantes en phase et en quadrature filtrées respectives (32, 33), et à formater les signaux en phase et en quadrature quantifiés (36, 37) et la composante de gain (G) pour produire ledit signal codé comprimé (21) à transmettre sur le support sélectionné (24) du système de communication.

4. Procédé selon la revendication 3, **caractérisé en outre par** l'étape consistant à décimer, avant la quantification, les composantes en phase et en quadrature filtrées respectives (32, 33) par un facteur M sélectionné pour produire des composantes en phase et en quadrature décimées respectives (34, 35).

5. Procédé selon la revendication 4, **caractérisé en outre par** l'étape consistant à interpoler le signal de communication (20) par un facteur M' sélectionné, avant le mixage du signal de communication (20) avec cos(Ωt) et sin(Ωt), pour produire les composantes en phase et en quadrature séparées respectives (30, 31) du signal.

6. Procédé selon la revendication 5, **caractérisé en outre par** l'étape consistant à filtrer les signaux en phase et en quadrature mixés reconstruits respectifs (46, 47) avant l'addition, pour extraire du domaine de fréquences de chaque composante toutes les fréquences situées au-dessus dudit niveau de filtrage

sélectionné, pour produire des signaux en phase et en quadrature filtrés reconstruits respectifs (48, 49).

7. Procédé selon la revendication 6, **caractérisé en outre par** l'étape consistant à interpoler les signaux en phase et en quadrature reconstruits (42, 43) par un facteur m sélectionné, avant le mixage.

8. Procédé selon la revendication 7, **caractérisé en outre par** l'étape consistant à décimer, avant l'addition, les signaux en phase et en quadrature filtrés reconstruits respectifs (48, 49) par un facteur m' sélectionné.

9. Procédé selon la revendication 8, **caractérisé en outre par** l'étape consistant à déterminer la fréquence centrale approchée, Ω, du signal de communication (20), à déterminer le type de signal de communication et à attribuer des valeurs présélectionnées pour le traitement du signal de communication (20), sur base du type de signal.

10. Procédé selon la revendication 9, **caractérisé en outre en ce que**:

la valeur présélectionnée assignée à Ω est de 1800 (figure 4), M est choisi à la valeur 10, M' est choisi à la valeur 3, le niveau de filtrage est choisi à 1400 Hz et les composantes en phase et en quadrature décimées respectives (34, 35) sont quantifiées en 6 niveaux lorsqu'il est déterminé que le signal de communication (20) est un signal fax; ou
la valeur présélectionnée attribuée à Ω est de 1200 (figure 3), M est choisi à la valeur 20, M' est choisi à la valeur 3, le niveau de filtrage est choisi à 700 Hz, et les composantes en phase et en quadrature décimées respectives (34, 35) sont quantifiées en 32 niveaux lorsqu'il est déterminé que le signal de communication (20) est un signal de bande d'appel d'un signal modem à bande dédoublée; ou
la valeur présélectionnée attribuée à Ω est de 2400 (figure 3), M est choisi à la valeur de 20, M' est choisi à la valeur 3, le niveau de filtrage est choisi à 700 Hz et les composantes en phase et en quadrature décimées respectives (34, 35) sont quantifiées en 32 niveaux lorsqu'il est déterminé que le signal de communication (20) est un signal de bande de réponse d'un signal modem à bande dédoublée; et
la valeur présélectionnée attribuée à Ω' est de 1800 (figure 4), m est sélectionné à la valeur 10, m' est sélectionné à la valeur 3 et le niveau de filtrage est sélectionné à 1400 Hz lorsqu'il est déterminé que ledit signal codé comprimé (21) correspondant audit signal de communication (20) est un signal fax et est reçu audit emplacement de réception; ou
la valeur présélectionnée attribuée à Ω' est de 1200 (figure 3), m est sélectionné à la valeur de 20, m' est sélectionné à la valeur de 3 et le niveau de filtrage est sélectionné à 700 Hz lorsqu'il est déterminé que ledit signal codé comprimé (21) correspondant audit signal de communication (20) est un signal de bande d'appel d'un signal modem à bande dédoublée et est reçu audit emplacement de réception; ou
la valeur présélectionnée attribuée à Ω' est de 2400 (figure 3), m est sélectionné à la valeur de 20, m' est sélectionné à la valeur de 3 et le niveau de filtrage est sélectionné à 700 Hz lorsqu'il est déterminé que ledit signal codé comprimé (21) correspondant audit signal de communication (20) est un signal de bande de réponse d'un signal modem à bande dédoublée et qu'il est reçu audit emplacement de réception.

11. Système de télécommunication pour échanger des signaux de communication (20) de différents types entre différents emplacements (10, 11) par l'intermédiaire d'un support (24), dans lequel le signal de communication (20) est comprimé pour faciliter sa transmission par l'intermédiaire du support sélectionné (24), et ledit signal de communication (21) est

reconstruit après réception ; ledit système de télécommunication comprenant un codeur (22) de compression de signal, dans lequel ledit codeur (22) comprend :

un moyen pour transformer un signal de communication en deux composantes séparées, comprenant :

un moyen (27) pour déterminer la fréquence centrale approchée, Ω, du signal de communication (20),
un moyen pour mixer le signal de communication (20) avec cos(Ωt), pour produire une composante en phase (30) du signal, et
un moyen pour mixer le signal de communication (20) avec sin(Ωt), pour produire une composante en quadrature (31) du signal ; et

un moyen pour quantifier chacune des composantes en phase et en quadrature séparées (30, 31), pour ainsi coder les composantes en phase et en quadrature séparées (30, 31) du signal en des signaux en phase et en quadrature quantifiés (36, 37), et en un paramètre associé de gain de quantification (G), pour produire un signal codé comprimé (21) à transmettre par l'intermé-

diaire du support sélectionné (24) du système de communication, **caractérisé en ce que** ledit codeur comporte en outre un moyen pour insérer un mot unique (V) dans le signal codé comprimé (21) pour indiquer le type de signal communiqué.

12. Système selon la revendication 11, **caractérisé en outre en ce que** ledit codeur (22) comprend: un moyen pour filtrer chacune des composantes en phase et en quadrature séparées (30, 31) avant la quantification, pour extraire du domaine de fréquences de chaque composante toutes les fréquences situées au-dessus d'un niveau sélectionné, pour ainsi produire des composantes en phase et en quadrature filtrées respectives (32, 33); et un moyen de mise au format, pour multiplexer les signaux en phase et en quadrature quantifiés (36, 37) et la composante de gain (G), pour ainsi produire ledit signal codé comprimé (21) à transmettre par l'intermédiaire du support (24) du système de communication.

13. Système selon la revendication 12, **caractérisé en outre en ce que** ledit codeur (22) comprend un moyen pour décimer les composantes en phase et en quadrature filtrées respectives (32, 33) par un facteur M sélectionné avant la quantification.

14. Système selon la revendication 13, **caractérisé en outre en ce que** ledit codeur (22) comprend un moyen pour interpoler le signal de communication (20) par un facteur M' sélectionné avant le mixage du signal de communication (20) avec cos(Ωt) et sin (Ωt), pour produire les composantes de signal en phase et en quadrature séparées (30, 31).

15. Système selon la revendication 14, **caractérisé en ce que** ledit moyen (27) pour déterminer la fréquence centrale approchée, Ω, du signal de communication (20) détermine le type de signal de communication et attribue des valeurs présélectionnées à Ω, M, M', au niveau de filtrage et au nombre de niveaux de quantification, sur base du type de signal.

16. Système selon l'une ou plusieurs des revendications 11 à 15, **caractérisé en ce qu'**il comporte en outre:

un décodeur de décompression du signal (25), comprenant:

un moyen de décodage du format, pour séparer les signaux en phase et en quadrature quantifiés (36, 37) et la composante de gain (G) de chaque signal codé comprimé (21) reçu par l'intermédiaire du support sélectionné (24) du système de communication;
un moyen (28) pour déterminer la fréquence centrale approchée, Ω', du signal codé comprimé (21) décodé;
un moyen de décodage de quantification pour reconstruire les signaux en phase et en quadrature (36, 37) en accord avec la composante de gain (G), pour produire des signaux en phase et en quadrature reconstruits (42, 43);
un moyen pour mixer le signal en phase reconstruit (42) avec cos(Ω't) pour produire un signal en phase reconstruit mixé (46);
un moyen pour mixer le signal en quadrature reconstruit (43) avec sin(Ω't) pour produire un signal en quadrature reconstruit mixé (47); et
un moyen pour additionner lesdits signaux en phase et en quadrature reconstruits mixés respectifs (46, 47) pour reproduire un signal de communication décodé décomprimé (26).

17. Système selon la revendication 16, **caractérisé en outre par** un premier poste de communication (10) présentant ledit codeur de compression (22) et un second poste de communication (11) pour recevoir le signal codé comprimé (21) en provenance dudit premier poste (10), présentant ledit décodeur de décompression de signal (25).

18. Système selon la revendication 16, **caractérisé en outre par** plusieurs postes de communication (10, 11) qui comprennent chacun au moins l'un desdits codeurs de compression de signal (22) et au moins l'un desdits décodeurs de décompression de signal (25).

19. Système selon la revendication 18, **caractérisé en outre par** au moins l'un desdits postes de communication (10) comprenant:

plusieurs desdits codeurs de compression de signal (22) et plusieurs desdits décodeurs de décompression de signal (25), pour coder et décoder un type sélectionné de signal;
un moyen pour sélectionner l'un desdits plusieurs codeurs (22) pour traiter un signal (20) à transmettre en accord avec le type du signal; et
un moyen pour sélectionner l'un desdits plusieurs décodeurs (25) pour traiter un signal reçu (21) en accord avec le type du signal.

20. Système selon l'une quelconque des revendications 16 à 19, **caractérisé en ce que** ledit moyen (28) pour déterminer la fréquence centrale approchée Ω' du signal codé comprimé (21) détermine le type de signal de communication et attribue une valeur présélectionnée à Ω' en fonction du type du signal.

21. Système selon l'une quelconque des revendications

16 à 19, **caractérisé en ce que**:

chaque codeur de compression de signal (22) comprend en outre un moyen pour filtrer chacune des composantes séparées (30, 31), en phase et en quadrature, du signal, avant la quantification, pour extraire du domaine de fréquences de chaque composante toutes les fréquences situées au-dessus d'un niveau sélectionné; et **en ce que**
chaque décodeur de décompression de signal (25) comprend en outre un moyen pour filtrer les signaux en phase et en quadrature reconstruits, mixés, respectifs (46, 47), avant l'addition, pour extraire du domaine de fréquences de chaque composante toutes les fréquences situées au-dessus d'un niveau de filtrage sélectionné, pour produire des signaux en phase et en quadrature reconstruits, filtrés, respectifs (48, 49).

22. Système selon la revendication 21, **caractérisé en ce que**:

chaque codeur de compression de signal (22) comprend en outre un moyen pour décimer les composantes en phase et en quadrature, filtrées, respectives (32, 33) par un facteur M sélectionné avant la quantification, pour produire des composantes en phase et en quadrature décimées respectives (34, 35); et **en ce que**
chaque décodeur de décompression de signal (25) comprend en outre un moyen pour interpoler les signaux en phase et en quadrature reconstruits (42, 43) par un facteur m sélectionné, avant le mixage.

23. Système selon la revendication 22, **caractérisé en ce que**:

chaque codeur de compression de signal (22) comprend en outre un moyen pour interpoler le signal de communication (20) par un facteur M' avant le mixage du signal de communication (20) avec cos(Ωt) et sin(Ωt), pour produire les composantes en phase et en quadrature séparées, respectives (30, 31) du signal; et
chaque décodeur de décompression de signal (25) comprend en outre in moyen pour décimer, avant l'addition, les signaux en phase et en quadrature reconstruits, filtrés, respectifs (48, 49) par un facteur m' sélectionné.

24. Système selon la revendication 23, **caractérisé en ce que**:

ledit codeur (22) comprend un moyen (27) pour déterminer le type de signal de communication, et attribue à chaque codeur (22) des valeurs présélectionnées pour Ω, M, M', le niveau de filtrage et le nombre de niveaux de quantification, sur base du type du signal (20); et
ledit décodeur (25) comprend un moyen (28) pour déterminer le type du signal de communication et attribue à chaque décodeur des valeurs présélectionnées pour Ω', m, m', le niveau du filtrage et le nombre de niveaux de quantification, sur base du type du signal.

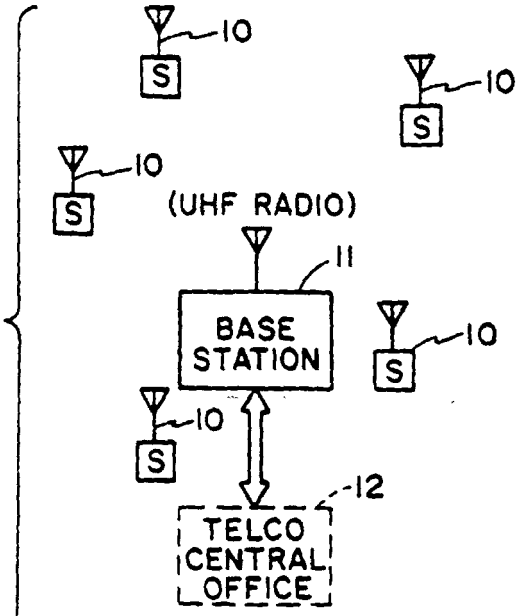
25. Système selon la revendication 24, **caractérisé en ce que**:

la valeur présélectionnée assignée à Ω est de 1800 (figure 4), M est choisi à la valeur 10, M' est choisi à la valeur 3, le niveau de filtrage est choisi à 1400 Hz et les composantes en phase et en quadrature décimées, respectives (34, 35) sont quantifiées en 6 niveaux lorsqu'il est déterminé que le signal de communication (20) est un signal fax; ou
la valeur présélectionnée attribuée à Ω est de 1200 (figure 3), M est choisi à la valeur 20, M' est choisi à la valeur 3, le niveau de filtrage est choisi à 700 Hz, et les composantes en phase et en quadrature décimées, respectives (34, 35) sont quantifiées en 32 niveaux lorsqu'il est déterminé que le signal de communication (20) est un signal de bande d'appel d'un signal modem à bande dédoublée; ou
la valeur présélectionnée attribuée à Ω est de 2400 (figure 3), M est choisi à la valeur de 20, M' est choisi à la valeur 3, le niveau de filtrage est choisi à 700 Hz et les composantes en phase et en quadrature décimées, respectives (34, 35) sont quantifiées en 32 niveaux lorsqu'il est déterminé que le signal de communication (20) est un signal de bande de réponse d'un signal modem à bande dédoublée; et
la valeur présélectionnée attribuée à Ω' est de 1800 (figure 4), m est sélectionné à la valeur 10, m' est sélectionné à la valeur 3 et le niveau de filtrage est sélectionné à 1400 Hz lorsqu'il est déterminé que ledit signal codé comprimé (21) correspondant audit signal de communication (20) est un signal fax et est reçu audit emplacement de réception; ou
la valeur présélectionnée attribuée à Ω' est de 1200 (figure 3), m est sélectionné à la valeur de 20, m' est sélectionné à la valeur de 3 et le niveau de filtrage est sélectionné à 700 Hz lorsqu'il est déterminé que ledit signal codé comprimé (21) correspondant audit signal de communication (20) est un signal de bande d'appel d'un signal modem à bande dédoublée et est reçu audit emplacement de réception; ou
la valeur présélectionnée attribuée à Ω' est de 2400 (figure 3), m est sélectionné à la valeur de

20, m' est sélectionné à la valeur de 3 et le niveau de filtrage est sélectionné à 700 Hz lorsqu'il est déterminé que ledit signal codé comprimé (21) correspondant audit signal de communication (20) est un signal de bande de réponse d'un signal modem à bande dédoublée et qu'il est reçu audit emplacement de réception.

26. Système selon la revendication 25, **caractérisé en ce que** ledit moyen (27) pour déterminer la fréquence centrale approchée, Ω, du signal de communication (20) détermine le type du signal de communication.

FIG. 1



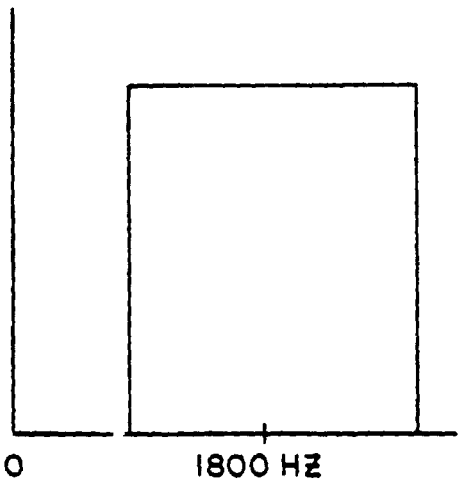


FIG. 4

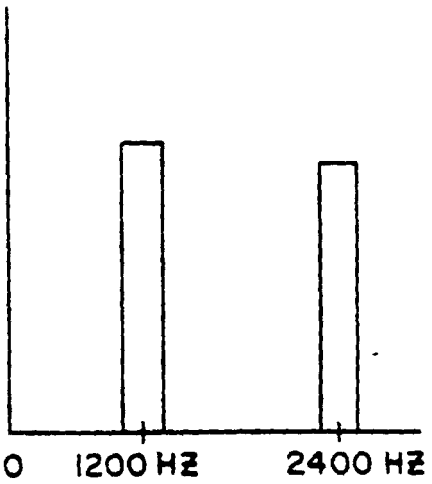
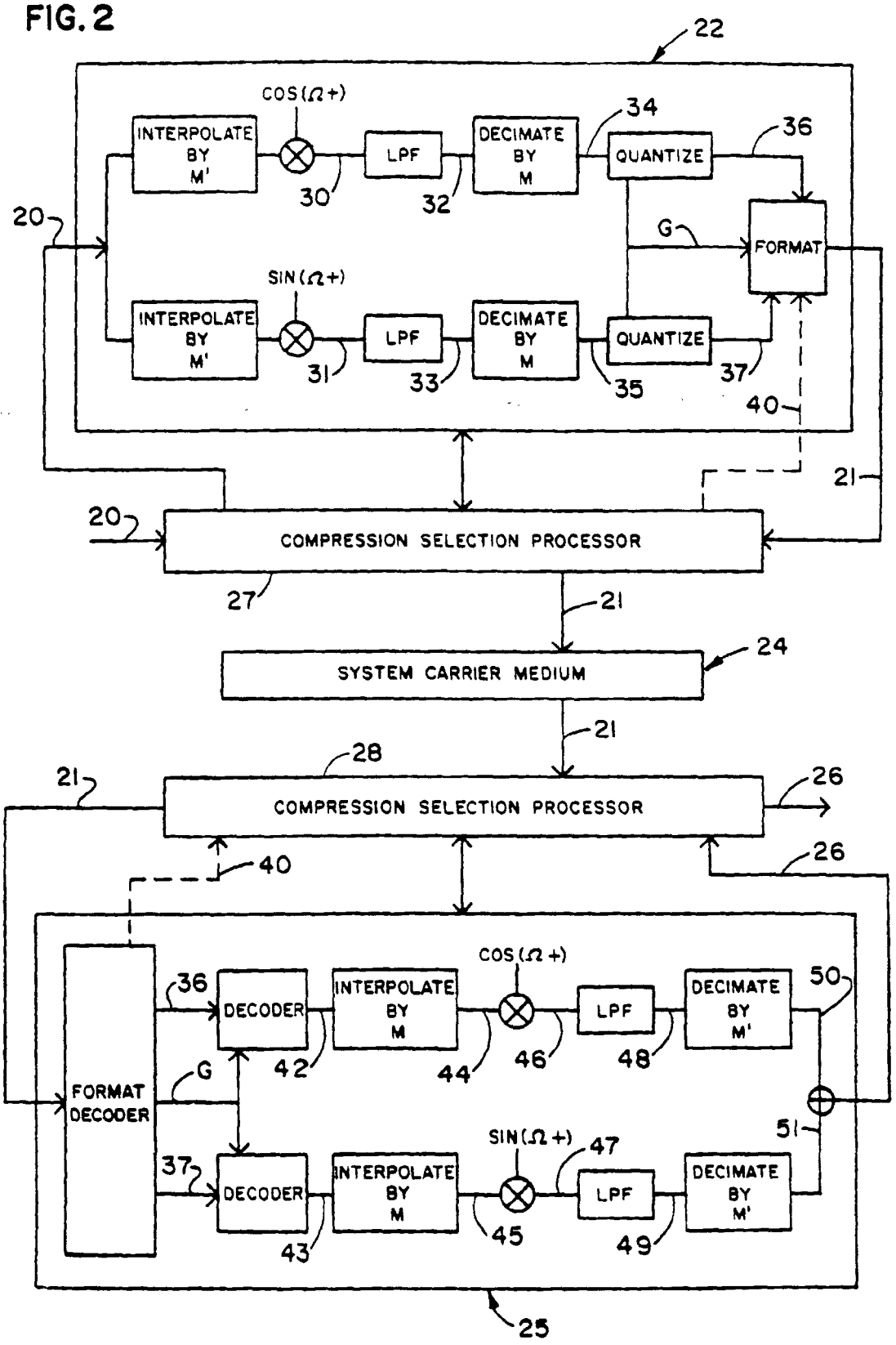
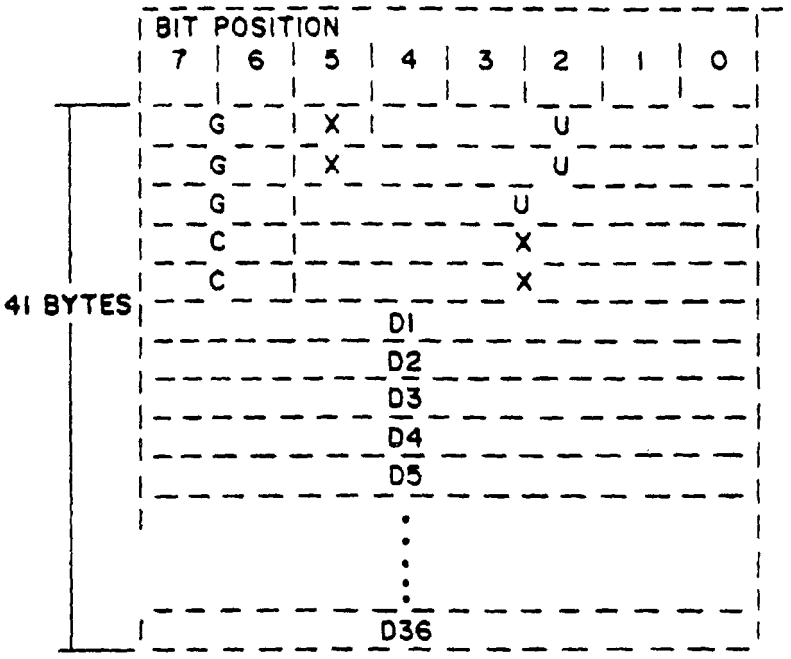


FIG. 3

FIG. 2


22
COS(Ω+)
INTERPOLATE BY M'
LPF
DECIMATE BY M
34
QUANTIZE
36
30
32
20
G
FORMAT
SIN(Ω+)
INTERPOLATE BY M'
LPF
DECIMATE BY M
QUANTIZE
31
33
35
37
40
21
20
COMPRESSION SELECTION PROCESSOR
27
21
24
SYSTEM CARRIER MEDIUM
21
28
26
21
COMPRESSION SELECTION PROCESSOR
40
26
COS(Ω+)
36
DECODER
INTERPOLATE BY M
LPF
DECIMATE BY M'
50
42
44
46
48
FORMAT DECODER
G
51
SIN(Ω+)
47
37
DECODER
INTERPOLATE BY M
LPF
DECIMATE BY M'
43
45
49
25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G X U
G X U
G U
C X
C X
41 BYTES
D1
D2
D3
D4
D5
D36

FIG.5

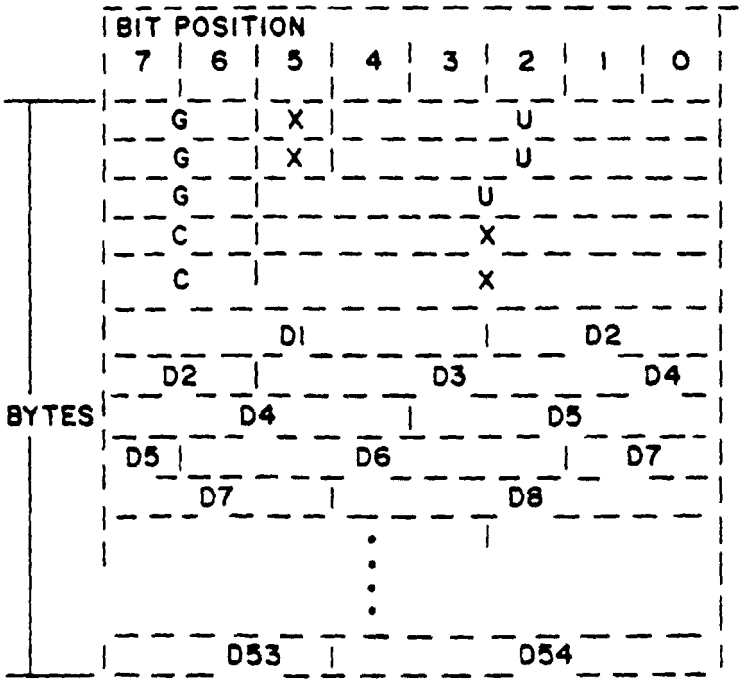
BIT POSITION
7 6 5 4 3 2 1 0
G X U
G X U
G U
C X
C X
D1 D2
D2 D3 D4
41 BYTES
D4 D5
D5 D6 D7
D7 D8
D53 D54

FIG.6

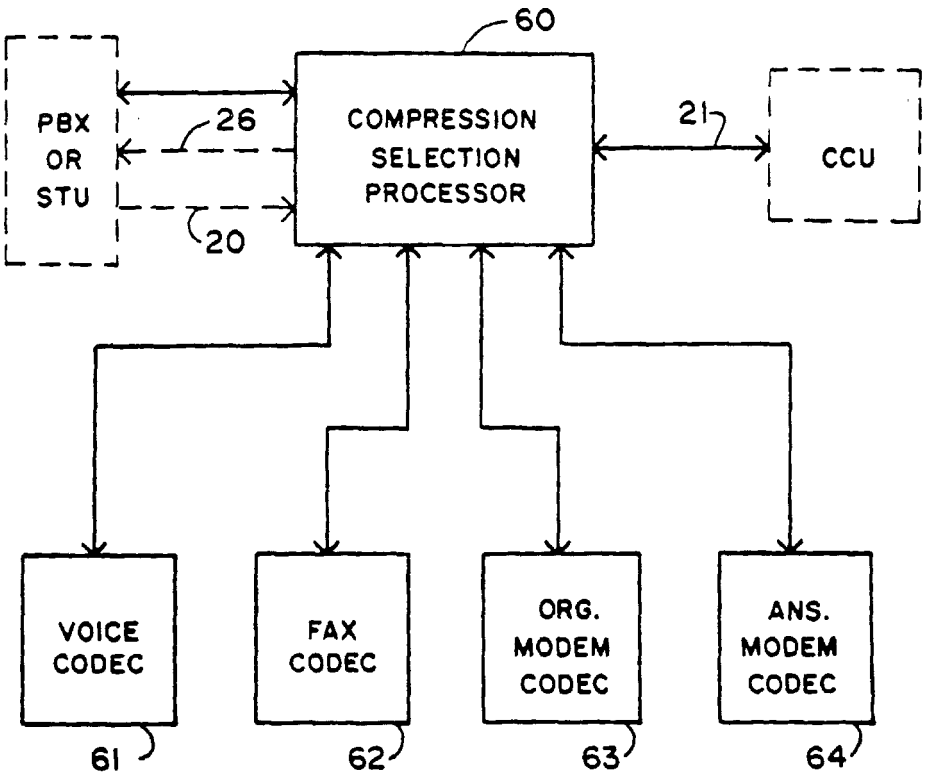
60
PBX
OR
STU
26
20
COMPRESSION
SELECTION
PROCESSOR
21
CCU
VOICE
CODEC
61
FAX
CODEC
62
ORG.
MODEM
CODEC
63
ANS.
MODEM
CODEC
64

FIG. 7