are decompressed and converted back to analog signals.

As a first step in the processing of the composite video signals within VCU 12, the sync signals are decoded to isolate signals for each picture frame for processing.

The video signals defining each frame may then be converted to a red analog signal, a green analog signal, and a blue analog signal in a conventional manner. The red, green and blue analog signals are then converted to digital form by the analog to digital converter (ADC) 24. The frame is divided into a set of closely positioned rows and columns of picture elements or "pixels." Each pixel has a color defined by a set of three digital values defining strength of the primary color components, red, green and blue (RGB) respectively. In one embodiment, each frame is divided into an array of 300 by 300 pixels, with the color and luminance of each pixel being defined by a seven bit word for the red component, a seven bit word for the blue component, and a seven bit word for the green component. These words are generated by ADC 24. The RGB video signal may also be processed by means of hue-saturation-intensity (HSI) color processing, where appropriate, as described in "Chips for Real-Time Comparisons," Electronic Engineering Times, issue 525, February 13, 1989, page 122.

If each frame includes 90,000 pixels (300 x 300), and each pixel is defined by 21 bits (7 bits per primary color), the digital representation of a single video frame utilizes a sizable block of digital information (i.e., 1.89 megabits/frame) which must be processed very rapidly. (Approximately 30 frames/second are received from AVRU 11.) Fortunately the analog to digital conversion of these signals may be accomplished at the desired speed using commercially available analog to digital converter integrated circuits. The analog to digital converter 24 (ADC) is a high-speed, high-accuracy, A to D "flash" converter available as a single IC (integrated circuit). Several different types of such A/D converters are available from Burr-Brown, one of which is the ADC 600. Part number TIC024, manufactured by Tektronix, Inc. is also

appropriate. Other types of devices appropriate for this function are described in an article by K. Rogers entitled "8-bit A/D Flash Hits 500 Msamples", Electronic Engineering Times, Dec. 12, 1988, page 90, incorporated herein by reference.

Compression of the digital data defining a video frame and the reverse process (decompression) are accomplished by compressor/decompressor 26. Various algorithms may be employed in the compression process which enable the representation of a series of numbers by a reduced number of digits. As an example, compression algorithms like CCITT Group IV may be used.

In one optional embodiment, to further reduce the amount of memory required to store a program, the compression algorithm can simply record data corresponding to only those pixels which change color from one frame to the next. This results in considerable memory space savings, since not all pixels change color each frame. Basing calculation upon 10% of the pixels changing from one frame to the next, it is estimated that memory requirements using this technique are cut by about 90%. It is also estimated that on the average, the CCITT Group IV algorithm can cut memory requirements by another 95%. Thus, if no data compression technique is used, it would take approximately 51.03 gigabytes to store a 2 hour video program, but by using the above compression techniques, it is estimated that memory 13 will require only 250 megabytes.

Controller 27 handles timing and aids in the communication between the different elements of VCU 12, and between VCU 12, AVRU 11 and memory 13.

In one embodiment, the audio portion of the program is periodically sampled and digitized by analog to digital conversion. In one embodiment, this is done at a sample rate of 88,000/second, one byte per sample, to yield compact disc quality sound. The sampling rate could be dropped to reduce memory requirements. Also, the audio data can be compressed with conventional algorithms.

The process of converting either from analog to digital

or from digital to analog requires memory for intermediate storage. Random Access Memory (RAM) 29 serves in this capacity. For this purpose either a DRAM (Dynamic RAM) or a SRAM (static RAM) may be employed. An example of a DRAM is the TI (Texas Instruments) TMX4C1024; an example of a SRAM is the INMOS IMS-1203. RAM 29 should have sufficient capacity to store at least two full uncompressed frames (e.g., about 472 KB).

The CPU (Central Processing Unit) 28 is a microprocessor which controls the digitization process of VCU 12. CPU 28 works with controller 27 to control and communicate with the other elements of the VCU. There are numerous commercially available microprocessors that are appropriate for this application. The Intel 80286, Intel 80386, Motorola 68020, and Motorola 68030 are examples. A more complete description of the microprocessors can be found in the October 27, 1988 issue of Electronic Design News (EDN), pages 231 and 242, incorporated herein by reference, or in the applicable data sheets.

Controller 27, CPU 28 and RAM 29 serve in the same manner during the reverse processes, i.e., decompression and digital to analog conversion. Decompression is first accomplished in compressor/decompressor 26. The decompressed digital signal is then converted to an analog signal by digital to analog converter (DAC) 24 (assuming its destination requires an analog form). In the course of converting the decompressed signals from the VCU 12 for use by the AVRU 11 the signals are synchronized by the time base generator (TBG) or corrector 48. TBG generator 48 inserts synchronization pulses into the signal provided by VCU 12 to identify individual raster scan lines and frames so that the resulting signal can be used by a conventional television set or VCR. TBG 48 can be bypassed by shunt switch 48' for the purpose of transmitting either compressed or decompressed signals from VCU 12 directly to the AVRU 11 in an uncorrected time based mode.

DAC 25 provides the inverse of the function performed by A/D converter 24. DAC 25 is a high-speed, high accuracy

digital to analog converter. An example of such a converter is the Burr-Brown DAC60 digital to analog converter.

Different types of memory technologies are adaptable for use in memory 13. As mentioned earlier, DRAM and SRAM semiconductor memories are commonly used for applications of this type and are readily available.

One type of random access memory is CMOS (Complimentary Metal Oxide Semiconductor). The CMOS memory has the advantage of a relatively low power requirement and is readily adaptable for use of battery backup for semi-permanent data storage. Other types of memory include the above mentioned optical disc memories, bubble memories and magnetic disks. Another appropriate data storage media may be "Digital Paper" available from ICI Image data of Wilmington, Delaware.

Emerging memory technologies may also prove advantageous with capabilities for mass data storage in even smaller physical dimensions.

Digital Control Unit (DCU) 14 comprises a CPU (Central Processor Unit) 31, a ROM (Read Only Memory) 32 and a controller 32. DCU 14 is responsible for all of the digital editing processes. Through the use of DCU 14, video segments may be edited and rearranged. Thus, one may use DCU 14 to rearrange the scenes in a program, alter the program sound track, etc.

In addition, a program may be edited, one frame at a time, by changing the contrast, brightness, sharpness, colors, etc. (Alteration of the contrast, brightness, sharpness and colors can be automated as well.) In one embodiment, images can be rotated, scaled (i.e., made larger or smaller), etc. In addition, pixel by pixel editing can be accomplished by DCU 14, e.g., in a manner similar to a PC paint program. Similar editing features can be incorporated for the audio portion of each program. In one embodiment, a display such as a flat panel video display (not shown) is built into the VCR-ET. A user interface control panel of DCU 14 allows a user to select a desired frame number from a menu on the display. The VCR-ET then displays a strip of

frames (including several frames before and after the selected frame). The user can delete frames in a strip, select a point where other frames are to be inserted into the program, or edit different frames (i.e., alter contrast, brightness, sharpness, colors, etc.). In one embodiment, a user input device such as a light pen or mouse can be used to select individual frames in a strip for editing.

Instead of incorporating a flat display into VCR-ET 10, in another embodiment, a television coupled to output lead 42 of RF modulator 19 can be used during editing.

CPU 31 is a microprocessor of the type described in connection with the CPU 28 of VCU 12. Controller 33 is an integrated circuit which handles the timing and interfacing between DCU 14 and memory 13. ROM 32 holds the necessary step-by-step editing programs which are installed at the factory. A currently available example of a suitable ROM for this application is the Texas Instruments part TMS47256. CPU 31 and controller 33 together control the editing process as they execute the programs stored in ROM 32.

The VCU 12, memory 13 and DCU 14 communicate with each other via a high speed data bus 34. The high speed data bus is required in order to meet bandwidth requirements. Examples of suitable data bus devices are Motorola's VME bus, Intel's Multibus and the Optobuss (U.S. Patent 4,732,446).

A video line or camera input line 15 is provided to enable VCR-ET 10 to receive an input signal from a source such as a television camera, a conventional VCR, a television tuner, or another VCR, etc. The signals received at input line 15 are typically carried by a coaxial cable and are in the form of a standard television composite signal. As used throughout this specification, the words "standard television composite signal" or its acronym STCS shall be read to include any one of the following: NTSC, PAL, SECAM, HDTV, or any American or European broadcast signal standards. (NTSC, PAL and SECAM are discussed in "Reference Data for Radio Engineers", published by Howard W.

Sams & Co. in 1983, incorporated herein by reference.) An NTSC composite signal is defined as the analog signal that carries the chrominance (color), luminance (brightness), synchronization (timing) and audio signals that make up the video signals received and displayed by television and video cassette recorders. These four components are combined into one signal by modulating the components in different ways. (Amplitude modulation and phase modulation are examples.) The standard video line signal is such a composite signal and may be received at input line 15 from one of the above-mentioned sources.

TV RF tuner input port 16 also supplies a composite signal as described in regard to video input line 15. The difference is that this signal is received from an antenna or cable TV coaxial cable. To receive such a signal, tuner 16 is capable of being set or tuned to receive the desired carrier frequency or television channel.

Selector switch 35 is provided to select either video input line 15 or TV RF tuner 16 as an input signal source to AVRU 11.

Auxiliary digital input port 17 is employed to receive any acceptable digital signal such as computer-generated video signal or as may be supplied by another VCR-ET. This signal, for example, may be an RGB video signal such as that delivered to computer monitors, or it may be a digitized audio signal. (As mentioned above, an RGB signal is a signal which communicates the strength of the red, green and blue color components for the pixels that make up each video frame.) Switch 36 selects whether the digital video/audio input signal is chosen from auxiliary digital input port 17. Switch 36 supplies the selected signal to high speed data bus 34 which carries the signals in digital form.

Fiber optic port 18 incorporates a fiber optic transceiver. Port 18 has a capability for transforming fiber optic (light) signals to electrical signals or for transforming electrical signals to fiber optic signals. Port 18 thus provides a capability for two-way communication between high speed data bus 34 and a fiber optic signal

line. The incorporation of fiber optic port 18 in the VCR-ET provides a capability for receiving audio/video signals from or delivering audio/video signals to the fiber optic line such as a fiber optic telephone line. The fiber optic line carries digital signals in the form of light waves over great distances with a high degree of accuracy and reliability and at a high speed (e.g., about 200 megabytes/second). The VCR-ET can receive/transmit a video program at an accelerated rate via fiber optic port 18 from/to a variety of sources. For example a video program may be communicated at an accelerated rate from the first VCR-ET to a second VCR-ET in less time than it would take to view the program. Thus, it is not necessary to access the optical fiber for long periods of time in order to transmit a long video program.

It is also envisioned that in the future, a video library may be established which downloads video programs at an accelerated rate via optical fibers to a subscriber's VCR-ET. After downloading, the program may be viewed, stored in memory, edited and/or a hard copy of the program may be made on magnetic tape, optical disk, etc.

Switch 37 is provided to select connection to the fiber optic input/output port 18. An OFF or open position is provided. The selected signal is delivered to or supplied from high speed data bus 34.

Analog output signals from AVRU 11 are delivered to the common terminal 38 of a selector switch 39. When set to position A, switch 39 delivers the output signal of AVRU 11 directly to a video output line 41 as a standard STCS composite signal; when set to position B switch 39 delivers the output of VRU 11 to the input of RF modulator 19. Modulator 19 converts the video signal to an RF-modulated composite signal for delivery to such devices as televisions and conventional VCR's. These types of devices play back the video program on a particular frequency channel (such as channel 4) on the television. Delivery to the television or VCR is via RF output line 42.

Digital output signals from VCR-ET 10 may be dispatched

from high speed data bus 34 via line 43 to input leads of RGB converter 21 and audio/video transmitter/receiver 22.

RGB converter 21 converts the STCS signal into an RGB signal as required by computer monitors and similar display devices. The converted signal is received by a display device connected to RGB converter output line 44.

VCR-ET 10 includes audio/video transmitter/receiver 22 which is typically a built-in modem. Advantageously, the modem may be used to communicate an audio/video program over conventional phone lines in a manner similar to that described above with respect to optical fibers. The term modem is derived directly from its functionality as a modulator-demodulator which allows transfer of the audio/video signal in a digital format over the standard telephone line. Modems are commonly available for computers and are currently available in the form of a single integrated circuit. As an example, Sierra Semiconductor offers a 2400 baud single chip modem under its part number SC111006. Representative manufacturers of these single modem IC's can be found in the April 14, 1988 issue of Engineering Design News (EDN), pages 124-125. Some of these single IC modems have the added capability of generating the tones for dialing a phone number. The destination phone number may be entered by means of an optional keyboard/keypad 45 incorporated in the video recorder 10 of the invention. Output port 46 of transmitter/receiver 22 connects directly to the telephone line.

Also associated with Modem 22 is an auxilliary keyboard 45' (Fig. 1A) of buttons for commanding the modem to perform tasks such as starting a transmission over phone lines (45a), terminating a transmission (45b), automatic telephone answering to receive transmissions (45c), using an optional speaker (not shown) to monitor phone lines (45d), using an optional microphone (not shown) to speak over the phone lines (45e) and for controlling the baud rate (45f).

The application and utilization of the VCR-ET may include a number of forms or operating modes. In its first and simplest operating mode, AVRU 11 may be operated in the

manner of a conventional VCR with signals from an antenna being received by tuner 16 and recorded directly on media 23 in analog form. At the same time the received program may be viewed on the television screen with the television connected at video output terminal 42. An optional signal source for this type of operation is the video line or camera input line 15 selectable by switch 35.

In a second operating mode a program stored in media 23 of AVRU 11 may be played back and viewed on the connected television set.

When it is desired to copy a program from one recording media to another, the recording media holding the desired program is installed in the AVRU. The recording media is then played back with optional viewing on a connected television set or other TV monitor or listening through speakers (as appropriate). As the recording media is played back, the analog signals from the recording media (video and/or audio) are dispatched to VCU 12 via connection 47. The analog signals are converted to digital signals by ADC 24, compressed by compressor/decompressor 26 and the compressed digital signals are stored in memory 13. The foregoing operations are accomplished under the control of controller 27 and CPU 28. RAM 29 is used for interim data storage during this process. Once the complete video/audio program has been stored in memory 13, the recording media from which the stored program has just been read is replaced by blank recording media upon which the stored program is to be copied. CPU 28 in cooperation with controller 27 and RAM 29 then executes the decompression and digital to analog conversion of the program stored in memory 13, decompression taking place in compressor/decompressor 26, and digital to analog conversion being accomplished by DAC 25. The resulting analog program is stored on the blank recording media which constitutes media 23 of AVRU 11.

In an alternate mode of operation, the decompression circuitry of VCU 12 can be bypassed. Thus, a user has the option of downloading the stored program from memory 13 onto recording media 23 in compressed digital format. The user

can then reload the program from media 23 into memory 13 at a future time for viewing, editing or recording back onto recording media 23 in analog form. This capability allows the user to quickly clear memory 13 for other interim uses and also provides the user with a hard copy of the program in digital format. The hard copy in compressed digital format has a number of uses, e.g. it could be archived for later viewing, transmitted by an appropriate independent transmitter, etc.

During the foregoing procedures, DCU 14 may be utilized for editing operations. As the program is being read from the first or original recording media, it is simultaneously viewed on the TV screen, or listened to by means of an audio monitor, converted to digital signals, compressed and stored in memory 13. Once the digital audio/video program is stored in memory 13, editing is accomplished by the user through control of DCU 14, by means of a control panel (not shown) coupled to DCU 14. If desired, additional audio/video signals may be simultaneously entered into memory 13 and added to those received from VCU 12. The additional signals may be introduced from auxiliary digital input port 17 or from fiber optic input/output port 18 and may comprise video captions for super imposed position upon the stored video images, or they may be audio commentaries to be added to silent video presentations. In addition, as mentioned above, the order in which various segments appear in the video programs may be altered. Certain undesired segments, such as TV commercials, may be removed. This editing operation is accomplished under the control of DCU 14.

In still another operating mode, a program stored in media 23 of AVRU 11 or being received by AVRU 11 from input line 15 (as from a video camera) may be digitized and compressed by VCU 12 and routed via bus 34, to memory 13. The data from memory 13 is then routed to line 43, transmitter/ receiver 22 and to a telephone line. At the other end of the telephone line the signals received are processed by another VCR-ET.

Once received in the second VCR-ET's memory 13, the digitized program can then either be viewed directly from memory or transferred to storage medium 23, either in its entirety or in random segments, based on user preference.

In the case of video camera input at input 15 the transmitted signals may comprise a live transmission. Alternatively the transmitted program may be derived from a program stored in media 23 of AVRU 11. In this case the stored analog program is again decoded, digitized, compressed and transmitted via bus 34 to memory 13. The data in memory 13 is then communicated via line 43 and transmitter/receiver 22 to telephone lines.

It follows, of course, that digitized video and audio signals from the remote VCR-ET at the other end of the telephone line may be received at line 46, entered into memory 13 via transmitter/receiver 22, converted to analog signals by VCU 12, and recorded on media 23 and then viewed, if desired, on a television set connected at output 42. A hard copy of the program may also be made for later viewing.

As mentioned earlier, when any of the foregoing operations entail the processing of unmodulated video signals, such signals must first be processed by RF modulator 19 before they can be accepted by devices such as a conventional VCR or television set; when the monitoring means is a computer monitor or a similar display device the signals are processed by RGB converter 21.

All of the foregoing operations are performed with enhanded quality and efficiency by virtue of the digital, rather than analog, storage and transmission modes and the compressed data storage mechanism, with additional advantages of improved cost and reliability afforded in the case of tape to tape (or other media to media) program transfers by virtue of the requirement for only a single tape deck or other storage device.

Fig. 3 illustrates an alternative embodiment invention in which AVRU 11 is not integral with VCU 12, memory 13 or editor 14. In this embodiment, AVRU 11 is a conventional, commercially available VCR which receives a modulated video

input signal on an input cable 50. In this embodiment AVRU 11 includes a RF tuner 51 for demodulating the input signal so it can be stored in media 23. AVRU 11 also includes a RF modulator 52 for modulating the signal received from media 23 and providing the RF modulated output signal on an output cable 53, which can be coupled to a television set. (TV RF tuner 51 and RF modulator 52 are provided in typical commercially available VCR's.) A switch 54 is provided to couple input cable 50 to output cable 53 when media 23 is not serving as a video signal source. The VCR-ET of this embodiment includes a TV RF tuner 55 which receives and demodulates the signal on cable 53, and provides the resultant analog audio/video signal on a lead 56, which is digitized and compressed as described above. In this alternative embodiment, the digitized compressed signal may be processed as described above, e.g. stored in memory 13 (via high speed bus 34), edited, transmitted by the fiber optic port 18 to another VCR-ET, etc. When it is desired to view a program stored in memory 13, data from memory 13 is decompressed and converted to an analog signal by VCU 12, and the resulting signal is provided on an output lead 57 to a RF modulator 58, which modulates the video signal so that it can be received and stored by AVRU 11 or viewed on a television coupled to cable 53. (As mentioned above, in the Fig. 3 embodiment, AVRU 11 is a conventional VCR.)

One advantage of the embodiment of Fig. 3 is that many people already own VCR's. Rather than buying apparatus which duplicates much of the hardware already present in their VCR, the embodiment of Fig. 3 would provide to owners of conventional VCR's capabilities which are otherwise currently unavailable in an economical manner.

In one embodiment, analog auxillary audio and video input terminals 62, 64 are provided so that analog signals may be provided by alternate sources to VCU 12.

The embodiments described above include means for transmitting/receiving video programs over fiber optic cables. However, in an alternative embodiment, either in

place of fiber optic port 18 or in addition to fiber optic port 18, means are provided for transmitting and/or receiving a video program via microwave. In conventional microwave technology, satellite systems and microwave transmitters transmit data using a low power/high frequency signal. In an embodiment of the invention designed to receive microwaves, the VCR-ET includes an amplifier for amplifying the microwave signal and a demodulator for obtaining the video program signal from the microwave signal. Receiving, amplifying and demodulating the microwave signal can be accomplished with conventional microwave transceiver equipment. The video program signal is typically in digital form, and may be stored, viewed or edited as in the above-described embodiments. Program data from memory 13 can also be transmitted by the microwave transciever, thereby providing the capability for microwave transmission of stored video programs in compressed digital format. Thus, the invention can be used to receive and transmit programs via microwaves at an accelerated rate similar to and at least as fast as, the transmission and reception of programs over optical fibers. This feature allows transmission and reception of programs in a few minutes or seconds using currently available technology. Both point-to-point microwave transceivers and satellite transceivers may be used.

The embodiments described include means for receiving, storing and transmitting both audio and video signals. However, the invention encompasses apparatus which can store and transmit video signals only and apparatus which can store and transmit audio signals only. An embodiment designed to store and compress audio signals is illustrated in Fig. 4. Referring to Fig. 4, an audio signal source 70 (a tape recorder, microphone, record player, etc.) is coupled to a digitizer and compressor circuit 72, which converts the analog signal to a digital signal and compresses the digital signal in a manner similar to VCU 12 described above. The digital compressed signal can then be stored in a memory 74. Of importance, data from memory 74

can be transmitted by a fiber optic transceiver 76, or by a microwave transceiver 78 at an accelerated rate. This is important not only in a home entertainment application, but in other applications as well. For example, a user can dictate an audio presentation and send it to a remote location (e.g. an office) at an accelerated rate without having to monopolize the transmission medium (e.g. the fiber optic cable) for an extended length of time.

The business uses of the embodiment illustrated in Fig. 4 makes home offices feasible for many workers now confined to more traditional offices and also opens new possibilities to business people who are traveling.

In the embodiment of Fig. 4, data can also be loaded from memory 74, via a modem 79 over a conventional phone line 80. Data can also be received from phone line 80, fiber optic transceiver 76 or microwave transceiver 78, loaded into memory 74, and converted to an analog signal by circuit 72, to be listened to via an audio monitor 82, or to be stored on an audio tape cassette 84 or other storage media.

An editor 86 is optionally provided so that the data in memory 74 may be edited, e.g., by rearranging the order of portions of the audio program, increasing or decreasing the volume of portions (or different frequency components) of the audio program, or enhancing the audio program through filtering techniques (e.g. to remove static and noise).

An improved audio/video recorder with significantly expanded functional capabilities is thus provided in accordance with the stated objects of the invention and although but a single embodiment of the invention has been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claim. For example, the VCR-ET can be constructed so as to be portable. Thus, it could be carried to a location where it is desired to record a program, and used to edit the program after it is recorded with a video camera. Other

modifications will be apparent to those skilled in the art in light of the present specification.

CLAIMS

What is claimed is:

1. Apparatus comprising:

first means for receiving a video signal from a VCR and digitizing said received signal;

memory means coupled to said first means for storing said digitized video signal; and

second means coupled to said memory means for converting said stored digitized signal to an analog video signal and providing said analog video signal to said VCR.

2. Apparatus of Claim 1 further comprising an editor for editing said digitized video signal stored in said memory means.

3. Apparatus of Claim 1 further comprising an I/O port for receiving data and storing said data in said memory means so that said received data can be converted to an analog video signal by said second means, and so that said data in said memory means can be communicated to said I/O port, whereby said apparatus facilitates communication of signals between said VCR and an auxiliary device coupled to said I/O port.

4. Apparatus of Claim 3 wherein said I/O port is an optic fiber I/O port.

5. Apparatus of Claim 3 wherein said I/O port is a modem.

6. Apparatus of Claim 3 wherein said I/O port is a microwave transceiver.

7. Apparatus of Claim 3 wherein said I/O port transmits and receives data corresponding to said video

signal at an accelerated rate.

8. Apparatus of Claim 1 wherein said first means compresses said digitized video signal prior to storage in said memory means.

9. Apparatus comprising:

means for receiving an analog audio signal;

means for digitizing said analog audio signal, thereby generating digital data corresponding to said audio signal and for compressing said digitized data;

means for storing said compressed digital data; and

transceiver means for transmitting said compressed digital data.

10. Apparatus of Claim 9 wherein said transceiver means also receives and stores compressed digital data in said means for storing, said apparatus also including means for converting the data stored in said means for storing into an analog audio signal.

11. Apparatus of Claim 10 wherein the time required by said transceiver means to transmit or receive said compressed digital data is less than the time required to monitor the audio signal corresponding to said data.

12. Apparatus comprising:

first means for receiving and converting an analog video signal to a digital video signal;

second means for storing said digital video signal, wherein said first means also receives said digital video signal back from said second means and reconverts said digital video signal back to an analog video signal for viewing;

third means for storing data; and

fourth means for transferring said digital video signal from said second means to said third means,

thereby makng said second means available for receiving and storing additional digital video signals.

13. Apparatus of Claim 12 wherein said first means also compresses data, so that said digital video signal is a compressed video signal, and wherein said third means is a video tape cassette capable of receiving said digital video signal from said second means, and third means also being capable of receiving and storing said reconverted analog video signal from said first means.

14. Apparatus of Claim 12 wherein said third means is remote from said first and second means and said fourth means comprises a microwave transceiver.

15. Apparatus of Claim 12 wherein said third means is remote from said first and second means and said fourth means comprises an optical fiber.

16. Apparatus of Claim 12 wherein said third and fourth means is remote from said first and second means and said fourth means comprises a telephone line.

17. Apparatus comprising:

first means for receiving and converting an analog audio signal to a digital audio signal;

second means for storing said digital audio signal, wherein said first means also receives said digital audio signal from said second means and reconverts said digital audio signal back to an analog audio signal for listening;

third means for storing data; and

fourth means for transferring said digital audio signal from said second means to said third means, thereby makng said second means available for receiving and storing additional digital audio signals.

18. Apparatus of Claim 17 wherein said first means

also compresses data, so that said digital audio signal is a compressed digital audio signal, and wherein said third means is a audio tape cassette capable of receiving said digital audio signal from said second means, and third means also being capable of receiving and storing said reconverted analog audio signal from said first means.

19. Apparatus of Claim 17 wherein said third means is remote from said first and second means and said fourth means comprises a microwave transceiver.

20. Apparatus of Claim 17 wherein said third means is remote from said first and second means and said fourth means comprises an optical fiber.

21. Apparatus of Claim 17 wherein said third and fourth means is remote from said first and second means and said fourth means comprises a telephone line.

22. Apparatus comprising:

receiving means for receiving and storing an audio signal in a first memory means during a first time period;

communication means for communicating said stored audio signal during a second time period substantially less than said first time period.

23. Apparatus of Claim 22 wherein said receiving means converts said received audio signal from an analog to digital format prior to storage, and said communication means transmits said stored audio signal to a location remote from said apparatus.

24. Apparatus comprising:

receiving means for receiving and storing an audio signal in a first memory means during a first time period;

means for providing said stored audio signal to a

speaker so that said signal can be listened to during a second time period substantially greater than said first time period.

25. Apparatus of Claim 24 wherein said receiving means receives said audio signal in digital format and converts said received audio signal from said digital format to an analog format, said receiving means receiving said audio signal from a location remote from said apparatus.

CPP/M-91

AUDIO/VIDEO RECORDER/TRANSCEIVER

Richard A. Lang

ABSTRACT OF THE DISCLOSURE

An improved video recorder/transceiver with expanded functionality ("VCR-ET") including a capability for storing video and video programs in digital format, editing such programs, transferring such programs onto a hard copy magnetic media, and transmitting such programs to a remote location using a second VCR-ET. The increased functionality is realized through the use of analog to digital conversion, signal compression and intermediate storage in an integrated circuit, random access memory. The recorder/transmitter has capabilities to transmit and receive program information in either a compressed or decompressed format over fiber optic lines, conventional phone lines or microwaves.

I hereby certify that this correspondence is being deposited with the United States Postal Service as express mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on MAY 5 [illegible]
19 89. Express Mail Receipt No. B206 949 487 [illegible]
5/5/89 Karen Ferrara
Date of Signature

775182

CPM/M914-DEC

Docket No.: M-914 US

DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled "AUDIO/VIDEO RECORDER/TRANSCEIVER" the specification of which

(check one) [ ] is attached hereto.
[XX] was filed

on May 5, 1989 as Application Serial No. 07/347,629

and was amended

on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

(Number)	(Country)	(Day/Month/Year Filed)
n/a		

I hereby claim the benefit under title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations,

CPM/M914-DEC

§1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

07/289,776	12/27/88	Pending
(Serial No.)	(Filing Date)	(Status-patented, pending, abandoned)

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

Alan H. MacPherson (24,423); Thomas S. MacDonald (17,774); Richard Franklin (19,128); Kenneth E. Leeds (30,566); Walter J. Madden, Jr., (16,661); Nathan N. Kallman (19,405); Paul J. Winters (25,246); Brian D. Ogonowsky (31,988); Edel M. Young (32,451); David W. Heid (25,875); Gideon Gimian (31,955); Guy W. Shoup (26,805); Stephen L. Malaska (32,655); Forrest E. Gunnison (32,899); and Norman K. Klivans (33,003).

Address all telephone calls to Kenneth E. Leeds
at telephone no. (408) 283-1222
Address all correspondence to Kenneth E. Leeds
SKJERVEN, MORRILL, MacPHERSON,
FRANKLIN & FRIEL
25 METRO DRIVE, SUITE 700
SAN JOSE, CALIFORNIA 95110

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

40100

Full name of sole or first inventor RICHARD A. LANG
Inventor's signature [signature]
Date 6/5/89
Residence Cave Creek, Arizona
Citizenship United States
Post Office Address 29209 N. 56th St., Cave Creek, Arizona 85331 AZ

IN THE

UNITED STATES PATENT AND TRADEMARK OFFICE

ART UNIT 235

Examiner W. Daniel Swayze

Richard A. Lang

CASE 211

SERIAL NO. 07/347,629

FILED May 5, 1989

SUBJECT AUDIO/VIDEO RECORDER/TRANSCEIVER

THE COMMISSIONER OF PATENTS AND TRADEMARKS
WASHINGTON, D.C. 20231

SIR:

REVOCATION OF POWER OF ATTORNEY AND
APPOINTMENT OF SUBSTITUTE ATTORNEY

The undersigned sole inventor named in the above-identified patent application hereby revokes all previous powers of attorney and appoints in their stead William E. Hein, Registration No. 26,465, P.O. Box 335, Loveland, Colorado 80539, as his attorney, with full power of substitution and revocation, to prosecute said application, to make alterations and amendments therein, to receive the Letters Patent, and to transact all business in the U.S. Patent and Trademark Office in connection therewith.

Please forward all future written communications to:

William E. Hein
Attorney at Law
P.O. Box 335
Loveland, Colorado 80539

Please direct telephone calls to William E. Hein at (303) 667-6741.

Respectfully submitted,

Richard A. Lang

May 3, 1990

POA. 211
#27

470394
~~07/326615~~

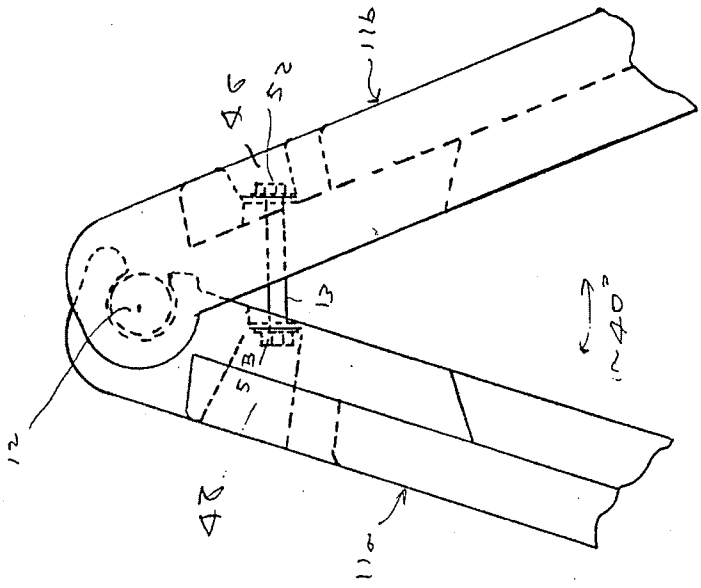


FIG-2

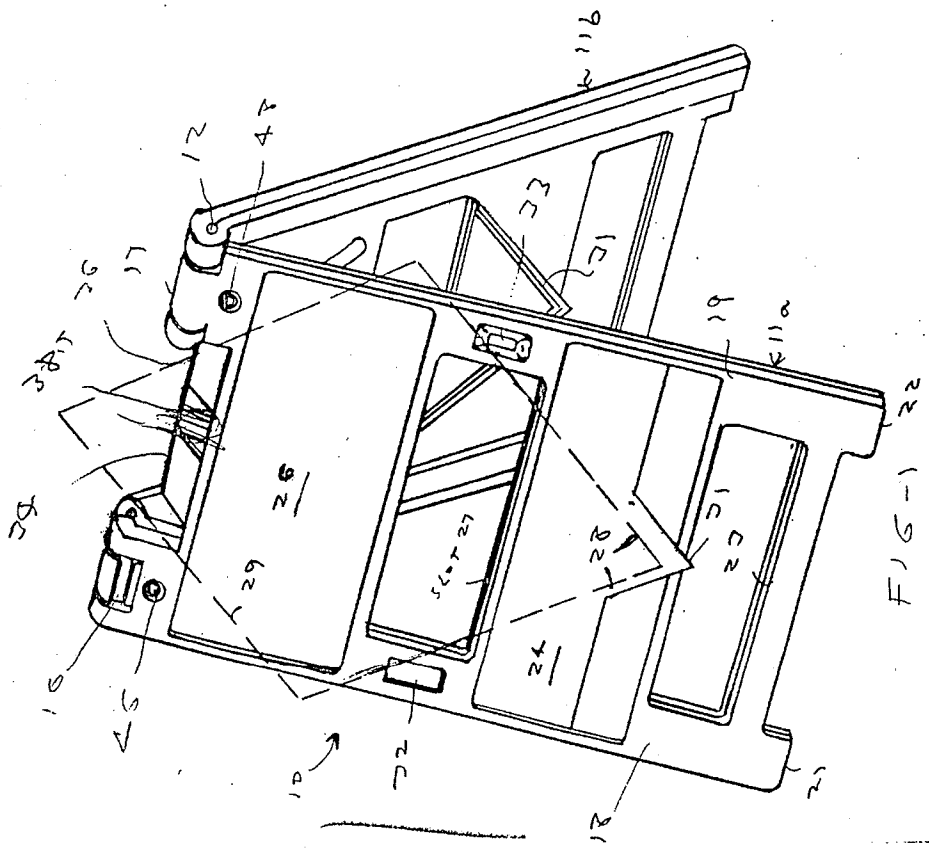


FIG-1

10

11/470394

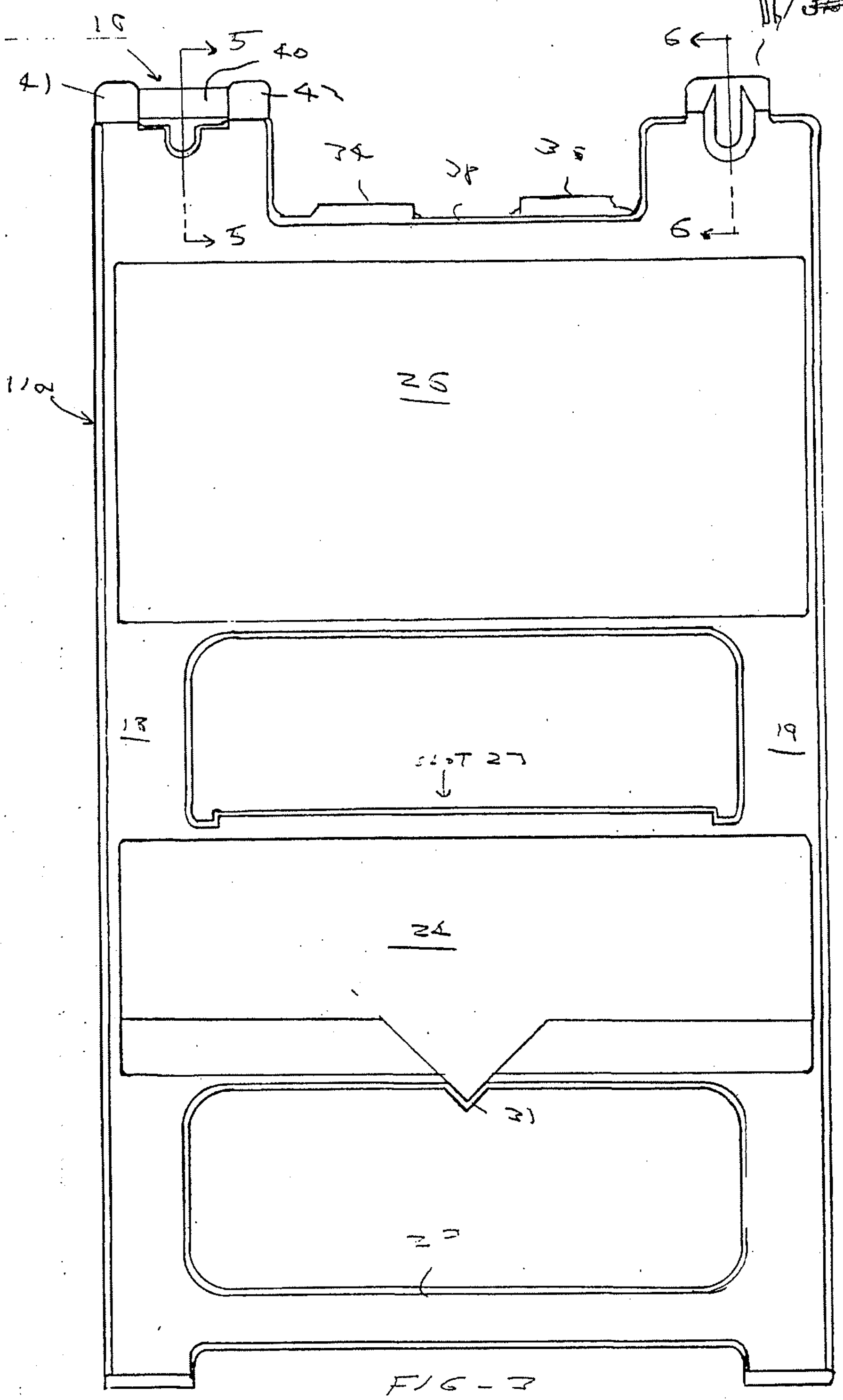


FIG-3
FRONT

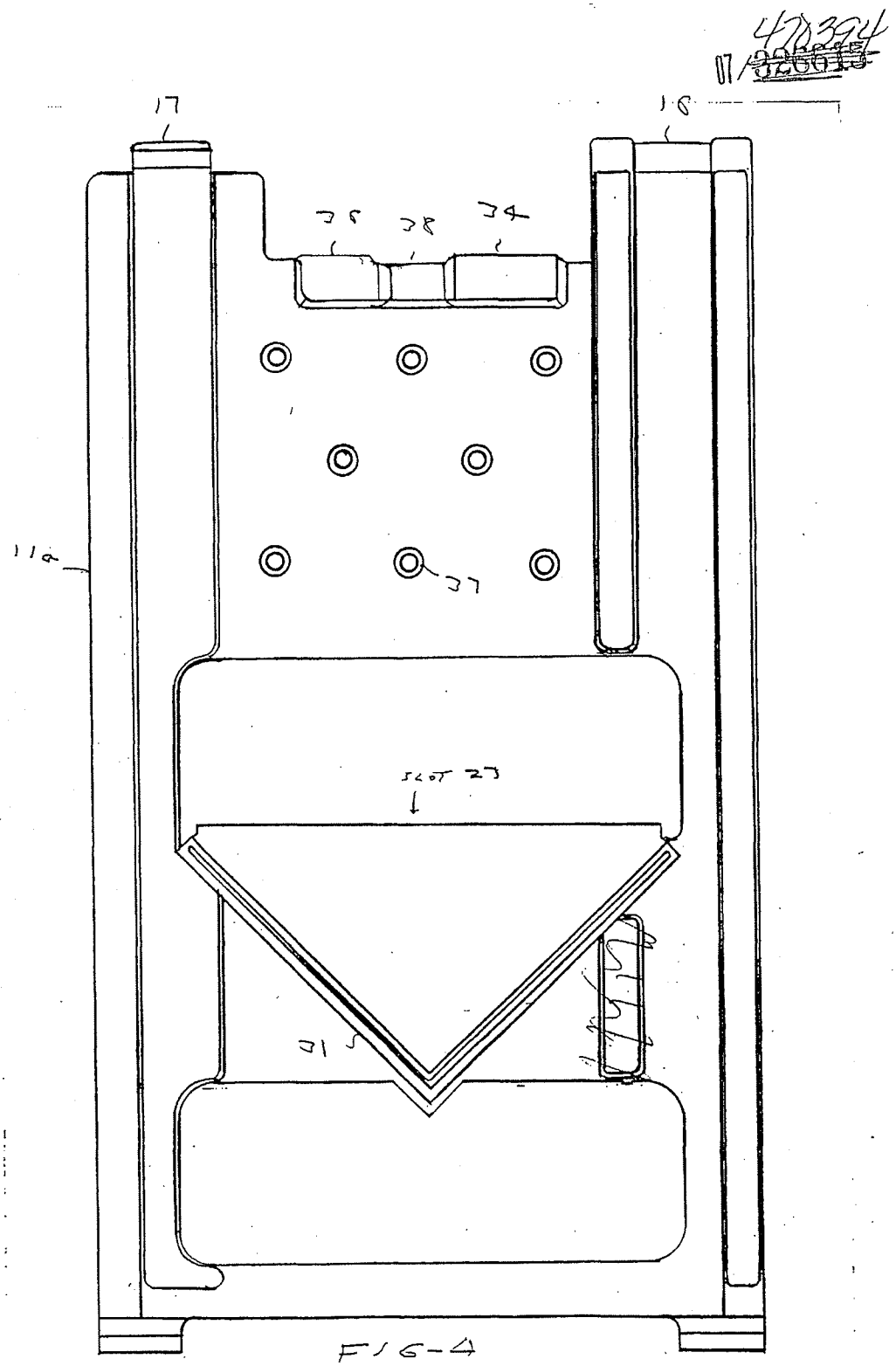


FIG-4
BACK

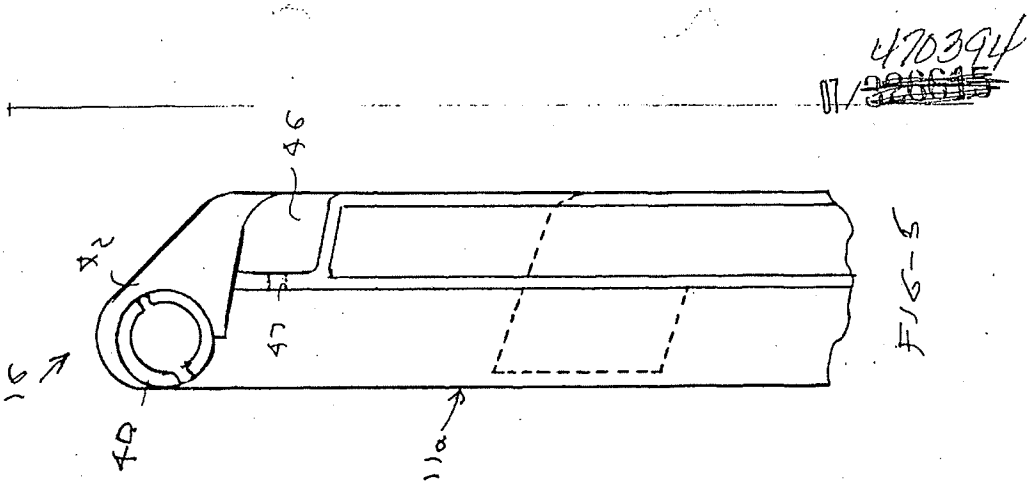


FIG-5

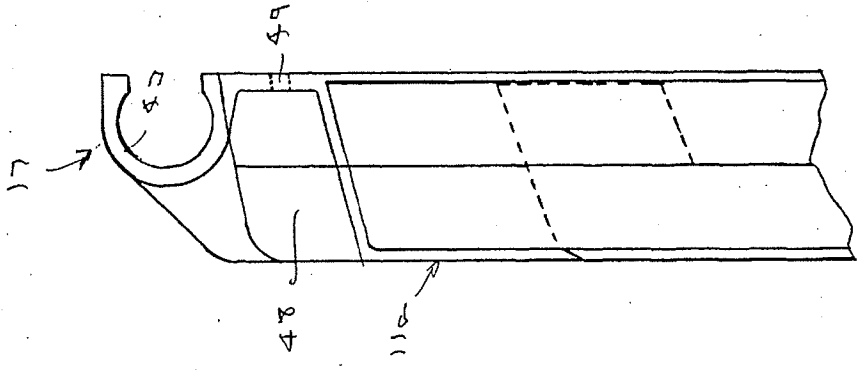


FIG-6

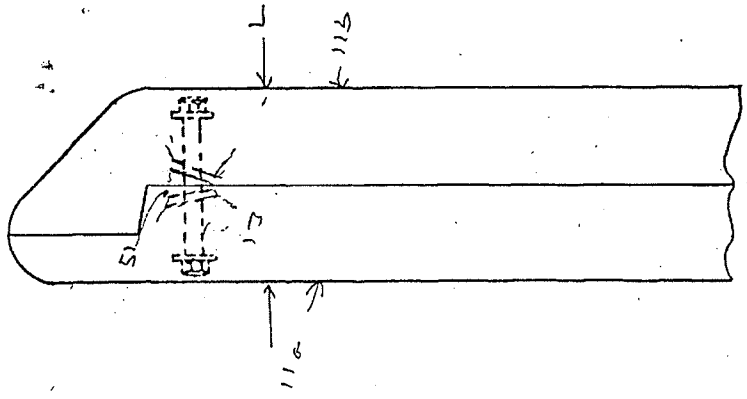


FIG 7

07/470394

FIG-9

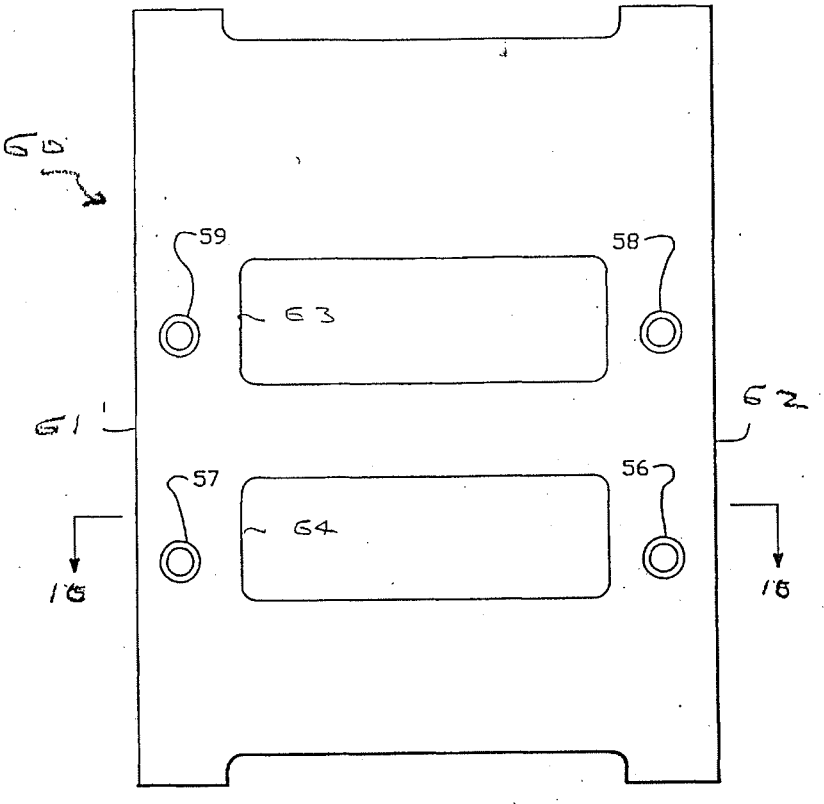


FIG-10

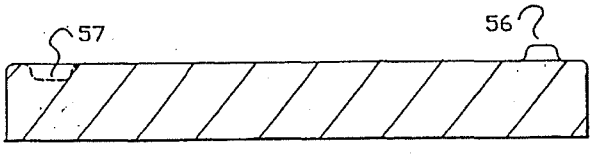
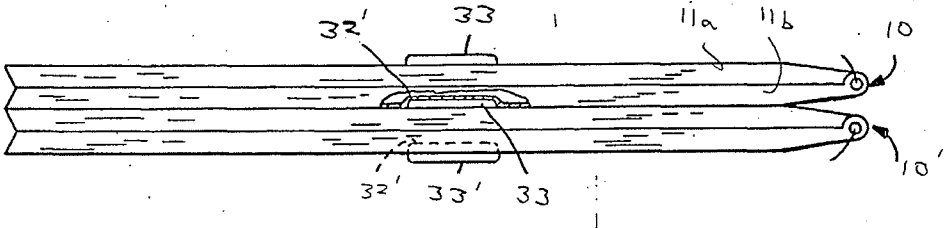


FIG-8



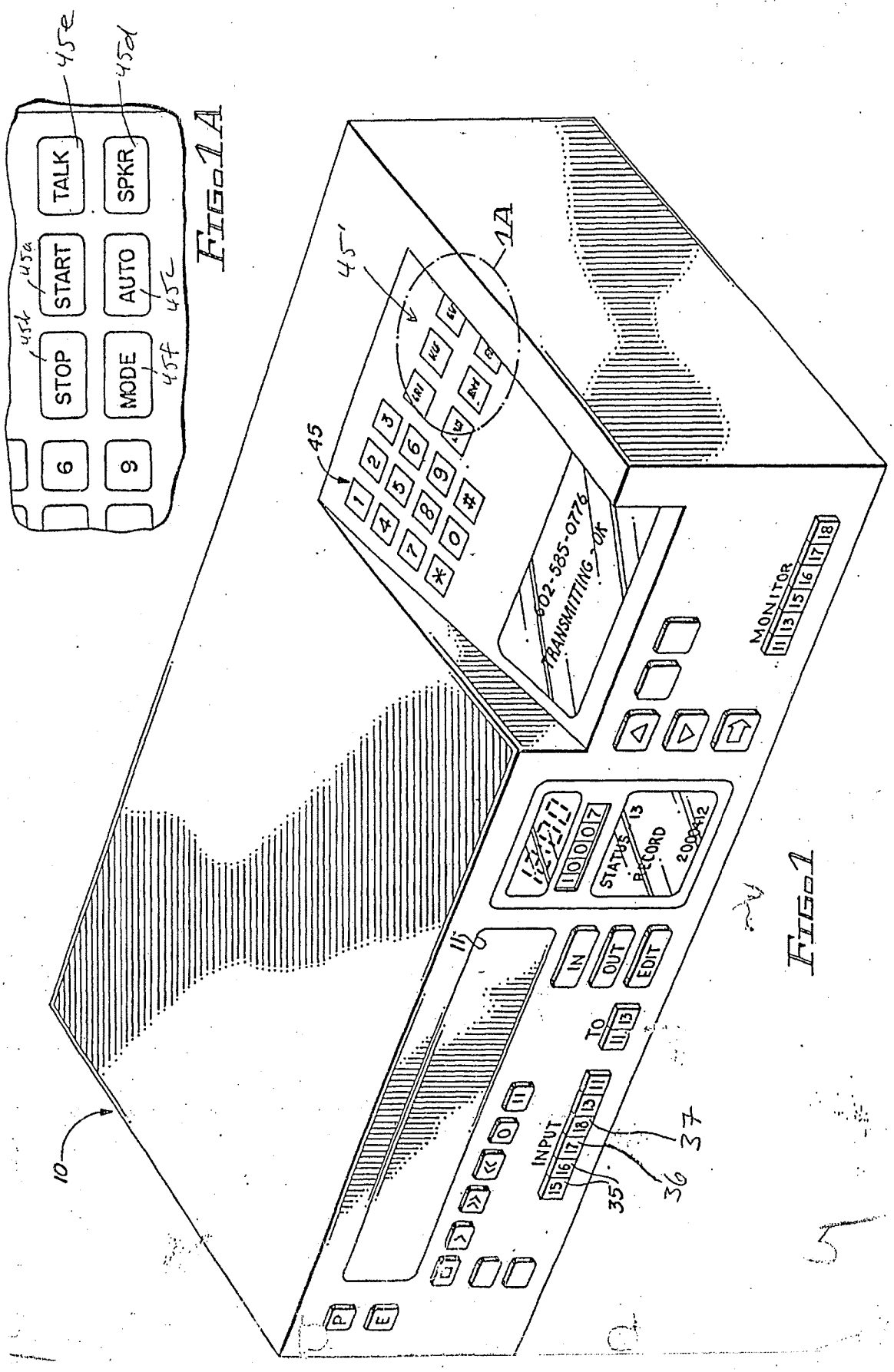

TALK
SPKR
START
AUTO
STOP
MODE
6
9
45e
45d
45a
45c
45b
45f
45'
12
45
602-585-0776
TRANSMITTING - OK
MONITOR
STATUS
RECORD
IN
OUT
EDIT
TO
INPUT
10
11
35
36
37

Fig. 1A

Fig. 1

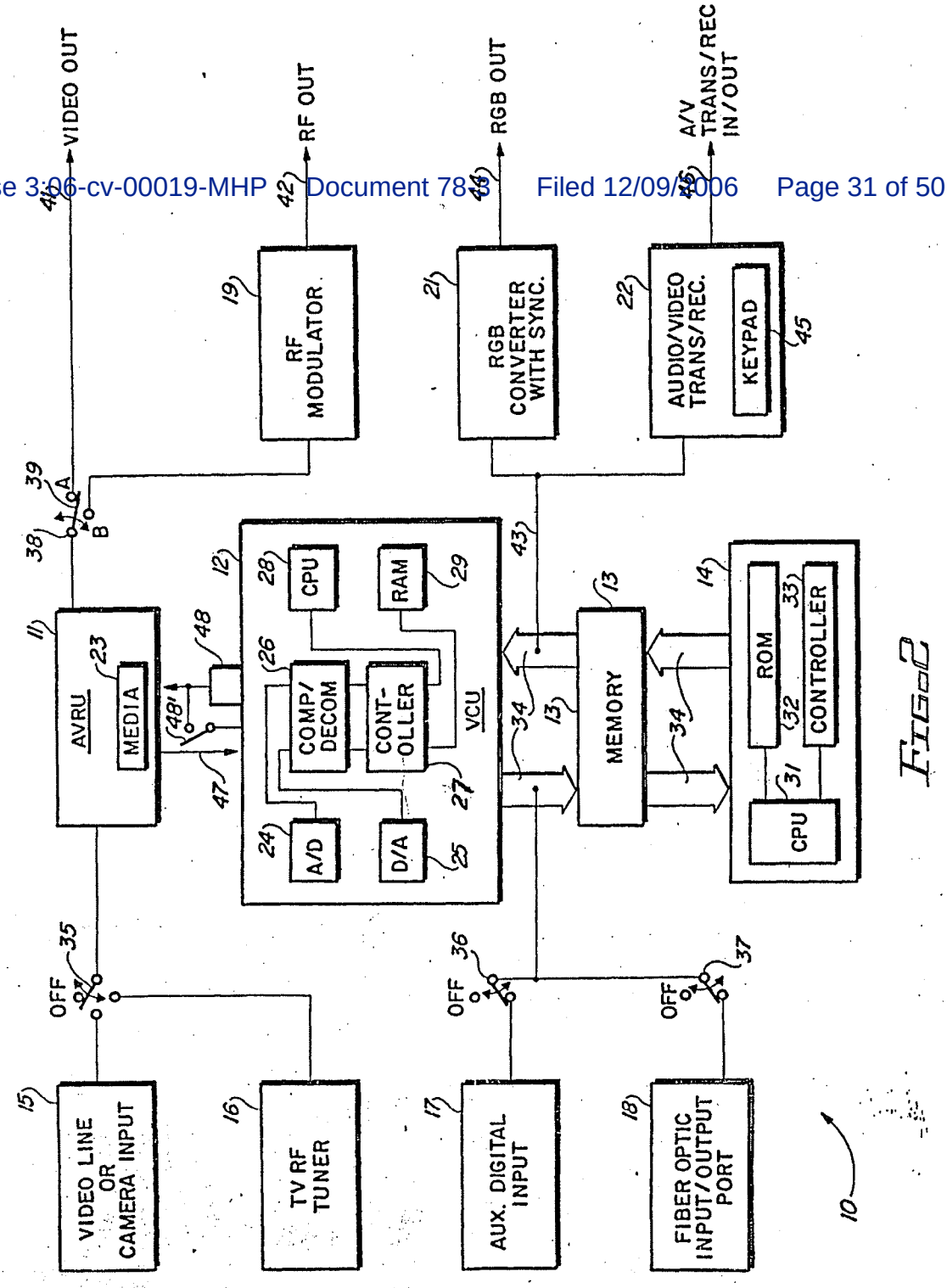

VIDEO OUT
RF OUT
RGB OUT
A/V TRANS/REC IN/OUT
RF MODULATOR
RGB CONVERTER WITH SYNC.
AUDIO/VIDEO TRANS/REC.
KEYPAD
AVRU
MEDIA
CPU
RAM
COMP/ DECOM
CONT-OLLER
VCU
A/D
D/A
MEMORY
ROM
CONTROLLER
CPU
OFF
VIDEO LINE OR CAMERA INPUT
TV RF TUNER
AUX. DIGITAL INPUT
FIBER OPTIC INPUT/OUTPUT PORT

Fig. 2

07 775182

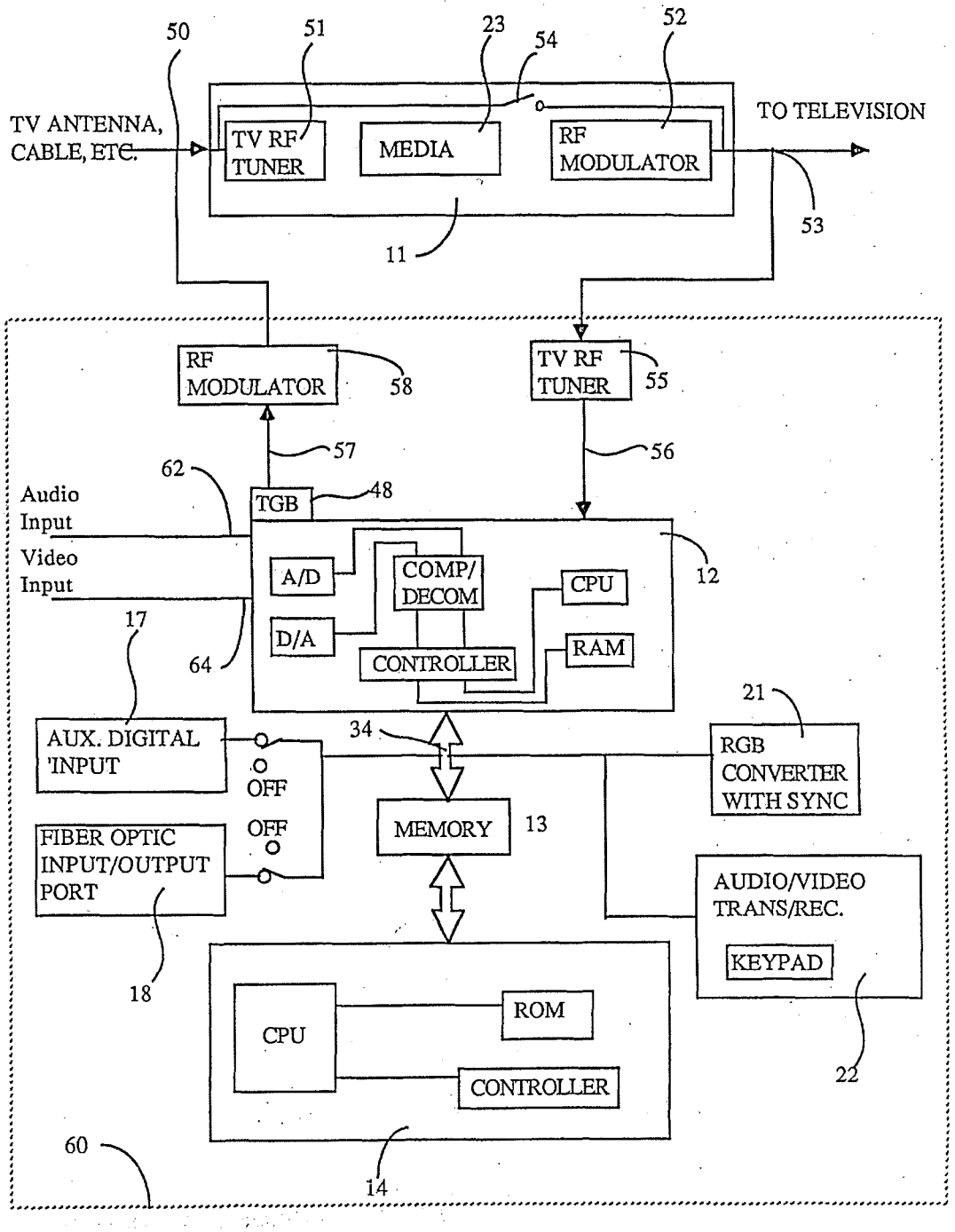


Fig. 3

07 775182

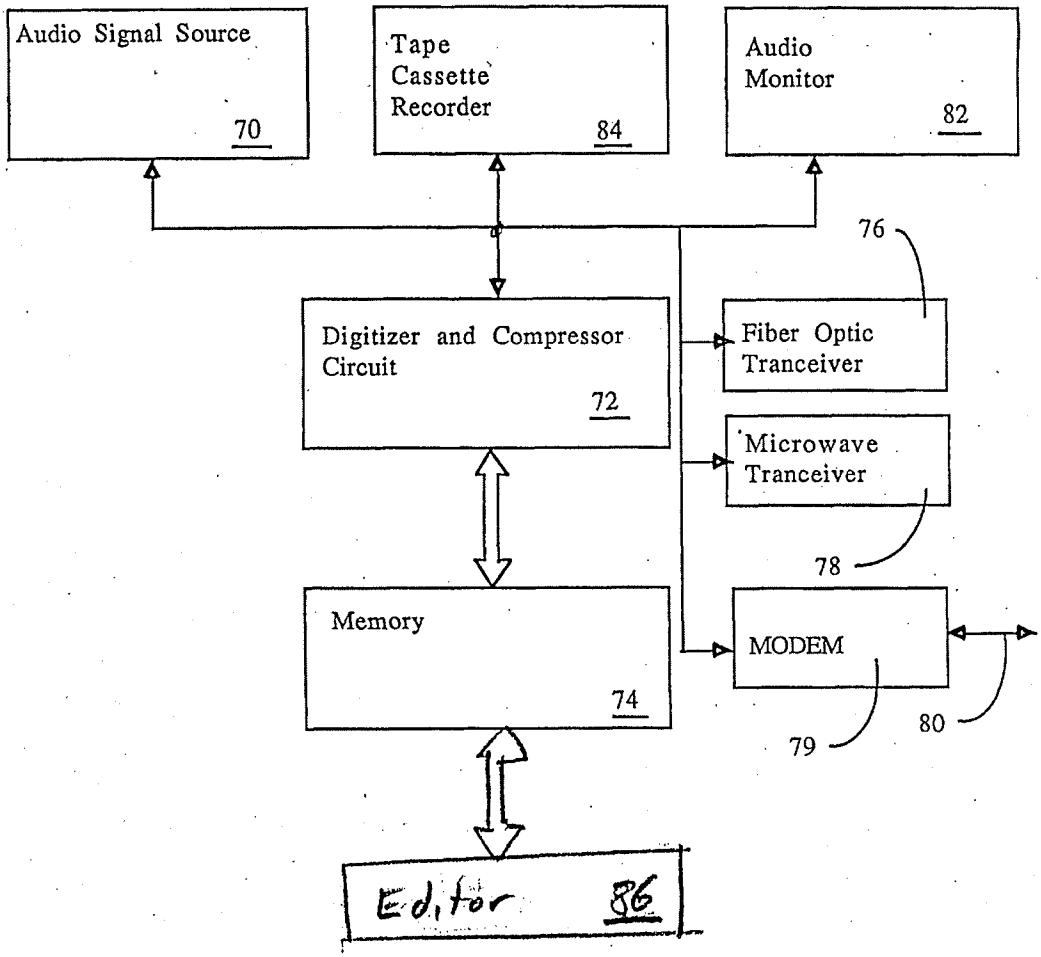


Figure 4

"Express Mail" mailing label number RB165452217X

Date of Deposit October 11, 1991

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

William E. Hein

(Typed or printed name of person mailing paper or fee)

(Signature of person mailing paper or fee)

07 775182

RULE 60 DIVISION-CONTINUATION PROGRAM APPLICATION TRANSMITTAL FORM

Attorney's Docket No. 249
Prior Application: 07/347,629
Examiner: H. Nguyen
Group Art Unit 235

THE COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

Dear Sir:

This is a request for filing a divisional application under Rule 60 of pending prior U.S. Patent Application Serial No. 07/347,629 entitled AUDIO/VIDEO RECORDER/TRANSCEIVER filed May 5, 1989, by Richard A. Lang.

1. Enclosed is a copy of U.S. Patent Application Serial No. 07/347,629, including the declaration, as originally filed. The undersigned attorney of record hereby verifies the enclosed papers to be a true copy of application Serial No. 07/347,629 as originally filed. The undersigned states that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

2. Cancel in this application original claims 2-25 of the prior application before calculating the filing fee.

3. The filing fee is calculated below:

TOTAL CLAIMS: 1-20 = 0 EXTRA INDEPENDENT CLAIMS: 1-3 = 0 EXTRA BASIC FEE (SMALL ENTITY)	= $315.00
TOTAL FILING FEE ENCLOSED	= $315.00

4. A verified statement claiming small entity status was filed in prior application Serial No. 07/347,629. Small entity status is still proper and desired in this Rule 60 divisional application.

5. A check in the amount of $315.00 is enclosed in payment of the filing fee calculated above.

6. Amend the specification by canceling the paragraph immediately preceding the section heading BACKGROUND OF THE INVENTION on page 1 of the specification and by substituting therefor the following new heading: --Reference to Related Applications-- and the paragraph: --This is a division of application Serial No. 07/347,629 filed May 5, 1989, which is, in turn, a continuation-in-part of application Serial No. 07/289,776 filed December 27, 1988.--.

7. Copies of the informal drawings as originally filed are enclosed.

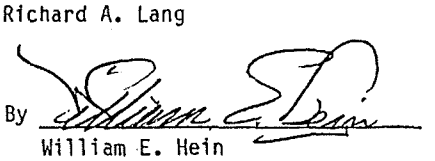
8. The prior application is assigned of record to Explore Technology, Inc., 7950 East Acoma Drive, Suite 211, Scottsdale, Arizona 85260.

9. The power of attorney in the prior application is to William E. Hein, Registration No. 26,465, P.O. Box 335, Loveland, Colorado 80539. Since this power does not appear in the original papers, a copy of the power of attorney to Mr. Hein in the prior application is enclosed herewith. Please address all future communications to the attorney of record in the prior application, William E. Hein, P.O. Box 335, Loveland, Colorado 80539.

10. A Preliminary Amendment is enclosed.

Respectfully submitted,

Richard A. Lang

By 

William E. Hein
Patent Attorney No. 26,465
P.O. Box 335
Loveland, Colorado 80539

October 4, 1991
(303) 667-6741
Loveland, Colorado

07 775182

2/a
Williams
12-9-91

"Express Mail" mailing label number RB180452 21X

Date of Deposit October 11, 1991

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

William E. Hein
(Typed or printed name of person mailing paper or fee)

(Signature of person mailing paper or fee)

RULE 60 DIVISION-CONTINUATION PROGRAM APPLICATION TRANSMITTAL FORM

Attorney's Docket No. 249
Prior Application: 07/347,629
Examiner: H. Nguyen
Group Art Unit 235

THE COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

Dear Sir:

This is a request for filing a divisional application under Rule 60 of pending prior U.S. Patent Application Serial No. 07/347,629 entitled AUDIO/VIDEO RECORDER/TRANSCEIVER filed May 5, 1989, by Richard A. Lang.

1. Enclosed is a copy of U.S. Patent Application Serial No. 07/347,629, including the declaration, as originally filed. The undersigned attorney of record hereby verifies the enclosed papers to be a true copy of application Serial No. 07/347,629 as originally filed. The undersigned states that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

2. Cancel in this application original claims 1-25 of the prior application before calculating the filing fee.

3. The filing fee is calculated below:

TOTAL CLAIMS: 1-20 = 0 EXTRA	
INDEPENDENT CLAIMS: 1-3 = 0 EXTRA	
BASIC FEE (SMALL ENTITY)	= $315.00
TOTAL FILING FEE ENCLOSED	= $315.00

4. A verified statement claiming small entity status was filed in prior application Serial No. 07/347,629. Small entity status is still proper and desired in this Rule 60 divisional application.

5. A check in the amount of $315.00 is enclosed in payment of the filing fee calculated above.

6. Amend the specification by canceling the paragraph immediately preceding the section heading BACKGROUND OF THE INVENTION on page 1 of the specification and by substituting therefor the following new heading: --Reference to Related Applications-- and the paragraph: --This is a division of application Serial No. 07/347,629 filed May 5, 1989, which is, in turn, a continuation-in-part of application Serial No. 07/289,776 filed December 27, 1988.--.

a'

7. Copies of the informal drawings as originally filed are enclosed.

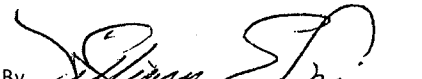
8. The prior application is assigned of record to Explore Technology, Inc., 7950 East Acoma Drive, Suite 211, Scottsdale, Arizona 85260.

9. The power of attorney in the prior application is to William E. Hein, Registration No. 26,465, P.O. Box 335, Loveland, Colorado 80539. Since this power does not appear in the original papers, a copy of the power of attorney to Mr. Hein in the prior application is enclosed herewith. Please address all future communications to the attorney of record in the prior application, William E. Hein, P.O. Box 335, Loveland, Colorado 80539.

10. A Preliminary Amendment is enclosed.

Respectfully submitted,

Richard A. Lang

By 

601 William E. Hein 301
Patent Attorney No. 26,465
602 P.O. Box 335
701 Loveland, Colorado 80539

October 4, 1991
(303) 667-6741
Loveland, Colorado

3/B
Williams
12-9-91

IN THE

UNITED STATES PATENT AND TRADEMARK OFFICE

ART UNIT 235

Examiner H. Nguyen

"Express Mail" mailing label number RB18845221X
Date of Deposit October 11, 1991
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.
William E. Hein
(Typed or printed name of person mailing paper or fee)
(Signature of person mailing paper or fee)

Richard A. Lang

CASE 249

SERIAL NO.

FILED October 11, 1991

SUBJECT AUDIO/VIDEO RECORDER/TRANSCEIVER

THE COMMISSIONER OF PATENTS AND TRADEMARKS
WASHINGTON, D.C. 20231

SIR:

Preliminary Amendment

Please amend the above-identified Rule 60 divisional patent application by canceling claim 1 and adding claim 26 as follows:

26. A method for handling audio/video source information, the method comprising:

receiving audio/video source information;

compressing said received audio/video source information into a time compressed representation thereof having an associated burst time period that is shorter than a time period associated with a real time representation of said received audio/video source information;

storing the time compressed representation of said received audio/video source information; and

transmitting, in said burst time period, the stored, time compressed representation of said received audio/video source information to a selected destination.

3 1

Remarks

Claim 1, remaining in this application following cancellation of original claims 2-25 by way of applicant's attached RULE 60 DIVISION-CONTINUATION PROGRAM APPLICATION TRANSMITTAL FORM, has been canceled, and new method claim 26 is presented herewith to provide the scope of claims coverage to which applicant believes he is entitled.

Respectfully submitted,

Richard A. Lang

By _____
William E. Hein
Patent Attorney #26,465

October 11, 1991
(303) 667-6741
Loveland, Colorado

07 775182

PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

080 KJ 10/21/91 07775182 1 201 315.00 CK 249

PTO-1556
(5/87)

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
07/775,182	10/11/91	LANG	R 249

EXAMINER
NGUYEN, H

ART UNIT	PAPER NUMBER
2305	4

WILLIAM E. HEIN
P.O. BOX 335
LOVELAND, CO 80539

DATE MAILED: 12/17/91

NOTICE OF ALLOWABILITY

PART I.

1. ☐ This communication is responsive to Applicant's amendment dated 10/11/91
2. ☒ All the claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice Of Allowance And Issue Fee Due or other appropriate communication will be sent in due course.
3. ☑ The allowed claims ~~are~~ is 26.
4. ☐ The drawings filed on _____ are acceptable.
5. ☐ Acknowledgment is made of the claim for priority under 35 U.S.C. 119. The certified copy has [_] been received. [_] not been received. [_] been filed in parent application Serial No. _____, filed on _____.
6. ☐ Note the attached Examiner's Amendment.
7. ☐ Note the attached Examiner Interview Summary Record, PTOL-413.
8. ☑ Note the attached Examiner's Statement of Reasons for Allowance.
9. ☐ Note the attached NOTICE OF REFERENCES CITED, PTO-892.
10. ☐ Note the attached INFORMATION DISCLOSURE CITATION, PTO-1449.

PART II.

A SHORTENED STATUTORY PERIOD FOR RESPONSE to comply with the requirements noted below is set to EXPIRE THREE MONTHS FROM THE "DATE MAILED" indicated on this form. Failure to timely comply will result in the ABANDONMENT of this application. Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

1. ☒ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-152, which discloses that the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.
2. ☐ APPLICANT MUST MAKE THE DRAWING CHANGES INDICATED BELOW IN THE MANNER SET FORTH ON THE REVERSE SIDE OF THIS PAPER.
   a. ☑ Drawing informalities are indicated on the NOTICE RE PATENT DRAWINGS, PTO-948, attached hereto or to Paper No. 4. CORRECTION IS REQUIRED.
   b. ☒ The proposed drawing correction filed on _____ has been approved by the examiner. CORRECTION IS REQUIRED.
   c. ☒ Approved drawing corrections are described by the examiner in the attached EXAMINER'S AMENDMENT. CORRECTION IS REQUIRED.
   d. ☑ Formal drawings are now REQUIRED.

Any response to this letter should include in the upper right hand corner, the following information from the NOTICE OF ALLOWANCE AND ISSUE FEE DUE: ISSUE BATCH NUMBER, DATE OF THE NOTICE OF ALLOWANCE, AND SERIAL NUMBER.

Attachments:

- _ Examiner's Amendment
- ✓ Examiner Interview Summary Record, PTOL-413
- ✓ Reasons for Allowance
- _ Notice of References Cited, PTO-892
- _ Information Disclosure Citation, PTO-1449
- ✓ Notice of Informal Application, PTO-152
- ✓ Notice re Patent Drawings, PTO-948
- _ Listing of Bonded Draftsmen
- _ Other

Roy N. Envall, Jr.
Supervisory
Patent Examiner
Art Unit 235

PTOL-37 (REV. 11-88) USCOMM-DC 89-3615

The following is an Examiner's Statement of Reasons for Allowance: The claim is considered allowable over the prior art of record since none of the prior art of record alone or in combination disclose or suggest a method for handling audio/video source information including the step of storing the time compressed representation of the received audio/video source information.

Any comments considered necessary by applicant must be submitted no later than the payment of the Issue Fee and, to avoid processing delays, should preferably accompany the Issue Fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Inquiries relative to the merits of this Office action should be directed to Huy Nguyen, at (703)-308-1547. Other inquiries of a general nature, and status inquiries, should be directed to the Group 230 receptionist at (703)-308-0754.

Roy N. Envall, Jr.
Supervisory
Patent Examiner
Art Unit 235

TO SEPARATE, HOLD TOP AND BOTTOM EDGES, SNAP--APART AND DISCARD CARBON

FORM PTO-892 (REV. 3-78)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	SERIAL NO.	GROUP ART UNIT	ATTACHMENT TO PAPER NUMBER
NOTICE OF REFERENCES CITED		07/775182		4
		APPLICANT(S) RICHARD A. LANG		

U.S. PATENT DOCUMENTS

*		DOCUMENT NO.	DATE	NAME	CLASS	SUB-CLASS	FILING DATE, IF APPROPRIATE
✓	A	4724491	2/88	Lambert	358	310	8/84
✓	B	4768110	8/88	Dunlap et al.	360	15	5/87
✓	C	4774574	9/88	Daly et al.	358	133	6/87
✓	D	5006936	4/91	Hooks Jr.	360	8	11/88
	E						
	F						
	G						
	H						
	I						
	J						
	K						

FOREIGN PATENT DOCUMENTS

*		DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS	SUB-CLASS	PERTINENT SHTS. DWG	PERTINENT PP. SPEC.
	L								
	M								
	N								
	O								
	P								
	Q								

OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)

	R	
	S	
	T	
	U	

EXAMINER	DATE
Huy Nguyen	12/12/91

* A copy of this reference is not being furnished with this office action.
(See Manual of Patent Examining Procedure, section 707.05 (a).)

PTO FORM 948
(Rev 5-91)

GROUP 235

U.S. DEPARTMENT OF COMMERCE
Patent and Trademark Office

ATTACHMENT TO PAPER NUMBER 4

APPLICATION NUMBER 775182.

NOTICE OF DRAFTSMAN'S PATENT DRAWING REVIEW

The PTO Draftsmen review all originally filed drawings regardless of whether they were designated as informal or formal.

The drawings filed 10/11/91.

A. ☐ are approved.

B. ☒ are objected to under 37 CFR 1.84 for reason(s) checked below. The examiner will require submission of new, corrected drawings at the appropriate time. Corrected drawings must be submitted according to the instructions listed on the back of this Notice.

1. Paper and Ink. 37 CFR 1.84(a)
   - ☐ Poor Quality Paper. Must Be White. Transparent Paper Not Allowed. Sheet(s) _____

2. Size of Sheet and Margins. 37 CFR 1.84(b)

   Acceptable Paper Sizes and Margins

Margin	Paper Size: 8 1/2 by 14 inches	8 1/2 by 13 inches	DIN size A4 21 by 29.7 cm.
Top	2 inches	1 inch	2.5 cm.
Left	1/4 inch	1/4 inch	2.5 cm.
Right	1/4 inch	1/4 inch	1.5 cm.
Bottom	1/4 inch	1/4 inch	1.0 cm.

   - ☐ Proper Size Paper Required. All Sheets Must be Same Size. Sheet(s) _____
   - ☒ Proper Margins Required. ~~Sheet(s)~~ 1, 4
     - ☒ Top ☐ Right
     - ☐ Left ☒ Bottom

3. Character of Lines. 37 CFR 1.84(c)
   - ☒ Lines Pale, Rough and Blurred, or Jagged. Fig(s) 4
   - ☐ Solid Black Shading Not Allowed. Fig(s) _____

4. ☐ Photographs Not Approved. _____

☐ Comments:

5. Hatching and Shading. 37 CFR 1.84(d)
   - ☐ Shade Lines are Required. Fig(s) _____
   - ☐ Criss-Cross Hatching Not Allowed. Fig(s) _____
   - ☐ Double Line Hatching Not Allowed. Fig(s) _____
   - ☐ Parts in Section Must be Hatched Properly. Fig(s) _____

6. Reference Characters. 37 CFR 1.84(f)
   - ☒ Reference Characters Poor or Rough and Blurred. Fig(s) 4
   - ☐ Minimum 1/8 inch (3.2 mm.) in height is required. Fig(s) _____
   - ☐ Figure Legends Poor or Placed Incorrectly. Fig(s) _____

7. Views. 37 CFR 1.84(i) & (j)
   - ☐ Figures Must be Numbered Separately. _____
   - ☐ Figures Must Not be Connected Fig(s) _____

8. Identification of Drawings. 37 CFR 1.84(l)
   - ☐ Extraneous Matter or Copy Machine Marks Not Allowed. Fig(s) _____

9. ☐ Changes Not Completed from Prior PTO-948 dated _____

Telephone inquires concerning this review should be directed to the Chief Draftsman at telephone number (703) 557-6404.

_____ Reviewing Draftsman

10/29/91 Date

INFORMATION ON HOW TO EFFECT DRAWING CHANGES

1. **Correction of Informalities—37 CFR 1.85**
File new drawings with the changes incorporated therein. The art unit number, serial number and number of drawing sheets should be written on the drawings in accordance with 37 CFR 1.84(l). Applicant may delay filing of the new drawings until receipt of the "Notice of Allowability" (PTOL-37). If delayed, the new drawings **MUST** be filed within the **THREE MONTH** shortened statutory period set for response in the "Notice of Allowability" (PTOL-37). Extensions of time may be obtained under the provisions of 37 CFR 1.136. The drawing should be filed as a separate paper with a transmittal letter addressed to the Official Draftsman.

   Timing of Corrections
   Applicant is required to submit acceptable corrected drawings within the three month shortened statutory period set in the "Notice of Allowability" (PTOL-37). Within that three month period, two weeks should be allowed for review by the Office of the correction. If a correction is determined to be unacceptable by the Office, applicant must arrange to have acceptable correction re-submitted within the original three month period to avoid the necessity of obtaining an extension of time and paying the extension fee. Therefore, applicant should file corrected drawings as soon as possible.

   Failure to take corrective action within set (or extended) period will result in **ABANDONMENT** of the Application.

2. **Corrections other than Informalities Noted by the Draftsman on the PTO-948**
All changes to the drawings, other than informalities noted by the Draftsman, **MUST** be made in the same manner as above except that, normally, a red ink sketch of the changes to be incorporated into the new drawings **MUST** be approved by the examiner before the application will be allowed. No changes will be permitted to be made, other than correction of informalities, unless the examiner has approved the proposed changes.

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address: Box ISSUE FEE
COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

WILLIAM E. HEIN
P.O. BOX 335
LOVELAND, CO 80539

NOTICE OF ALLOWANCE AND ISSUE FEE DUE

☐ Note attached communication from the Examiner
☒ This notice is issued in view of applicant's communication filed _____

SERIES CODE/SERIAL NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT		DATE MAILED
07/775,182	10/11/91	001	NGUYEN, H	2305	12/17/91

First Named Applicant: LANG, RICHARD A.

TITLE OF INVENTION: AUDIO/VIDEO RECORDER/ TRANSCEIVER

	ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
2	249	358-335.000	V65	UTILITY	YES	$565.00	03/17/92

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED.

THE ISSUE FEE MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED.

HOW TO RESPOND TO THIS NOTICE:

I. Review the SMALL ENTITY Status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:
A. If the Status is changed, pay twice the amount of the FEE DUE shown above and notify the Patent and Trademark Office of the change in status, or
B. If the Status is the same, pay the FEE DUE shown above.

If the SMALL ENTITY is shown as NO:
A. Pay FEE DUE shown above, or
B. File verified statement of Small Entity Status before, or with, payment of 1/2 the FEE DUE shown above.

II. Part B of this notice should be completed and returned to the Patent and Trademark Office (PTO) with your ISSUE FEE. Even if the ISSUE FEE has already been paid by a charge to deposit account, Part B should be completed and returned. If you are charging the ISSUE FEE to your deposit account, Part C of this notice should also be completed and returned.

III. All communications regarding this application must give series code (or filing date), serial number and batch number. Please direct all communications prior to issuance to Box ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees.

PTOL-85 (REV 12-88)(OMB Clearance is pending) PATENT AND TRADEMARK OFFICE COPY

5/C

RECEIVED
GROUP 2300
1992 JAN 17 PM 3:15

IN THE

UNITED STATES PATENT AND TRADEMARK OFFICE

ART UNIT 2305

Examiner H. Nguyen

Richard A. Lang

CASE 249

SERIAL NO. 07/775,182

FILED October 11, 1991

SUBJECT AUDIO/VIDEO RECORDER/TRANSCEIVER

THE COMMISSIONER OF PATENTS AND TRADEMARKS
WASHINGTON, D.C. 20231

SIR:

Supplemental Preliminary Amendment

Please amend the above-identified Rule 60 divisional patent application as follows:

In the specification

Page 1, line 1, cancel the present title and substitute the title -- METHOD FOR HANDLING AUDIO/VIDEO SOURCE INFORMATION--.

In the claims

Please amend claim 26 and add new claims 27-102 as follows:

claim 1 of the above-identified Rule 60 divisional patent application and add new claims 27-100 as follows:

~~26.~~ (amended) A method for handling audio/video source information, the method comprising:

receiving audio/video source information;

compressing [said] the received audio/video source information into a

040 RP 01/22/92 07775182 1 202 216.00 CK
040 RP 01/22/92 07775182 1 203 570.00 CK

time compressed representation thereof having an associated burst time period that is shorter than a time period associated with a real time representation of [said] the received audio/video source information;

storing [the] said time compressed representation of [said] the received audio/video source information; and

transmitting, in said burst time period, the stored[,] time compressed representation of [said] the received audio/video source information to a selected destination.

~~27.~~ A method as in claim ~~26~~ further comprising the steps of:

editing the stored time compressed representation of said audio/video source information; and

storing the edited time compressed representation of said audio/video source information.

~~28.~~ A method as in claim ~~27~~ further comprising the step of monitoring the stored, time compressed representation of said audio/video source information during editing.

~~29.~~ A method as in claim ~~26~~ wherein the step of transmitting comprises transmitting said time compressed representation of said audio-video source information over an optical channel.

~~30.~~ A method as in claim ~~26~~ wherein the step of transmitting comprises transmitting said time compressed representation of said audio-video source information over a telephone transmission channel.

~~31.~~ A method as in claim ~~26~~ wherein the step of storing comprises storing the time compressed representation of said audio/video source information on an optical disk.

~~32.~~ A method as in claim ~~26~~ wherein the step of storing comprises storing the time compressed representation of said audio/video source information in a semiconductor memory.

~~33.~~ A method as in claim ~~26~~ wherein:

said audio/video source information comprises analog audio/video source

information;

said method further comprises the step of converting said analog audio/video source information to corresponding digital audio/video source information;

said step of compressing comprises compressing said corresponding digital audio/video source information into a digital time compressed representation thereof having an associated burst time period that is shorter than a time period associated with a real time representation of said digital audio/video source information; and

said step of storing comprises storing said digital time compressed representation of said corresponding digital audio/video source information.

9 ~~34.~~ A method as in claim ~~26~~ 1 wherein:

said audio/video source information comprises digital audio/video source information;

said step of compressing comprises compressing said digital audio/video source information into a digital time compressed representation thereof having an associated burst time period that is shorter than a time period associated with a real time representation of said digital audio/video source information; and

said step of storing comprises storing said digital time compressed representation of said digital audio/video source information.

10 ~~35.~~ A method as in claim ~~33~~ 8 wherein said audio/video source information comprises information received from a television camera.

11 ~~36.~~ A method as in claim ~~33~~ 8 wherein said audio/video source information comprises information received from an analog video tape recorder.

12 ~~37.~~ A method as in claim ~~33~~ 8 wherein said audio/video source information comprises information received from a television RF tuner.

13 ~~38.~~ A method as in claim ~~33~~ 8 wherein said audio/video source information comprises information transmitted by a remotely located television transmitter.

14 ~~39.~~ A method as in claim 8 ~~33~~ wherein said audio/video source information comprises information received from a cable television system.

15 ~~40.~~ A method as in claim 9 ~~34~~ wherein said audio/video source information comprises information received from a computer.

16 ~~41.~~ A method as in claim 9 ~~34~~ wherein said audio/video source information comprises information received over a fiber optic transmission line.

17 ~~42.~~ A method for handling audio/video source information, the method comprising:

receiving audio/video source information as a time compressed representation thereof, said time compressed representation of said audio/video source information being received over an associated burst time period that is shorter than a real time period associated with real time playback of said audio/video source information;

storing the time compressed representation of said received audio/video source information; and

transmitting, in said burst time period, the stored time compressed representation of said received audio/video source information to a selected destination.

18 ~~43.~~ A method as in claim 17 ~~42~~ wherein said audio/video source information comprises information received over an optical channel from a video library storing a multiplicity of programs of audio/video source information as time compressed representations thereof for selective retrieval by a user in an associated burst time period.

19 ~~44.~~ A method as in claim 17 ~~42~~ wherein said audio/video source information comprises information received over a communications link from a video library storing a mutlitplicity of programs of audio/video source information as time compressed representations thereof for selective retrieval by a user in an associated burst time period.

20 ~~45.~~ A method as in claim 1 ~~28~~ further comprising the steps of: