United States Patent [19]

Flynn

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[54] **BROADCAST STATION LOGGER AND PRINTOUT SYSTEM**

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[73] Assignee: **Broadcast Products, Inc.**, Rockville, Md.

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[21] Appl. No.: **277,492**

[52] **U.S. Cl.** **340/172.5**

[51] **Int. Cl.** **G06k 3/00**, G05b 19/00

[58] **Field of Search** 340/172.5

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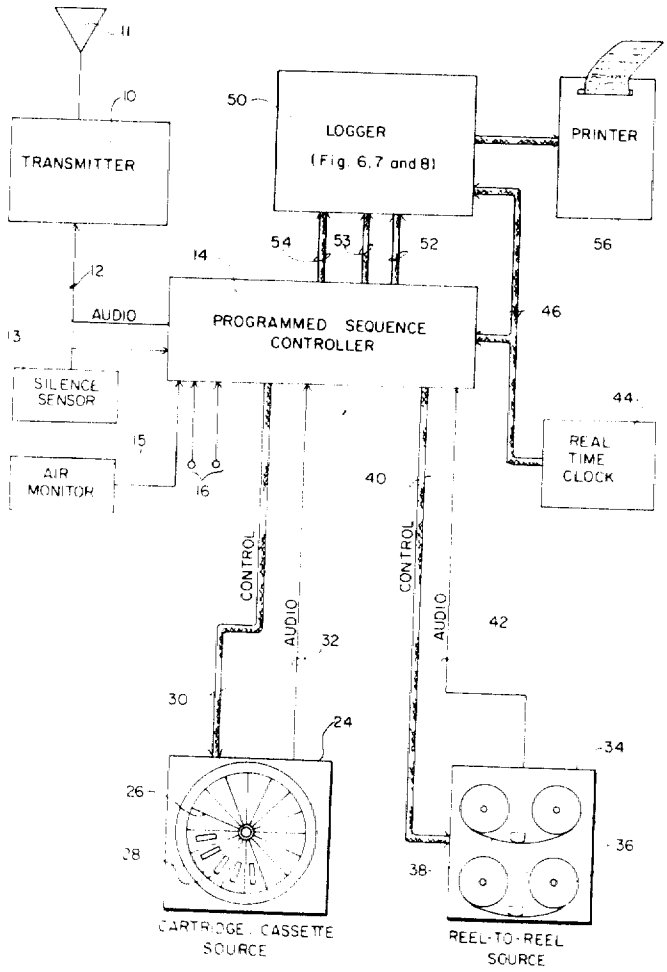
Attorney—Arthur E. Dowell, Jr. et al.

[57] **ABSTRACT**

A system for providing a printed log of program materials broadcast by a broadcast station, wherein data taken from a clock, from a programmed sequence controller, and from recorded program material sources is assembled and printed in the real time sequence in which the various source materials were commenced, the disclosure further including means for efficiently tagging the recorded sources with the data necessary to provide a complete printed log.

12 Claims, 9 Drawing Figures



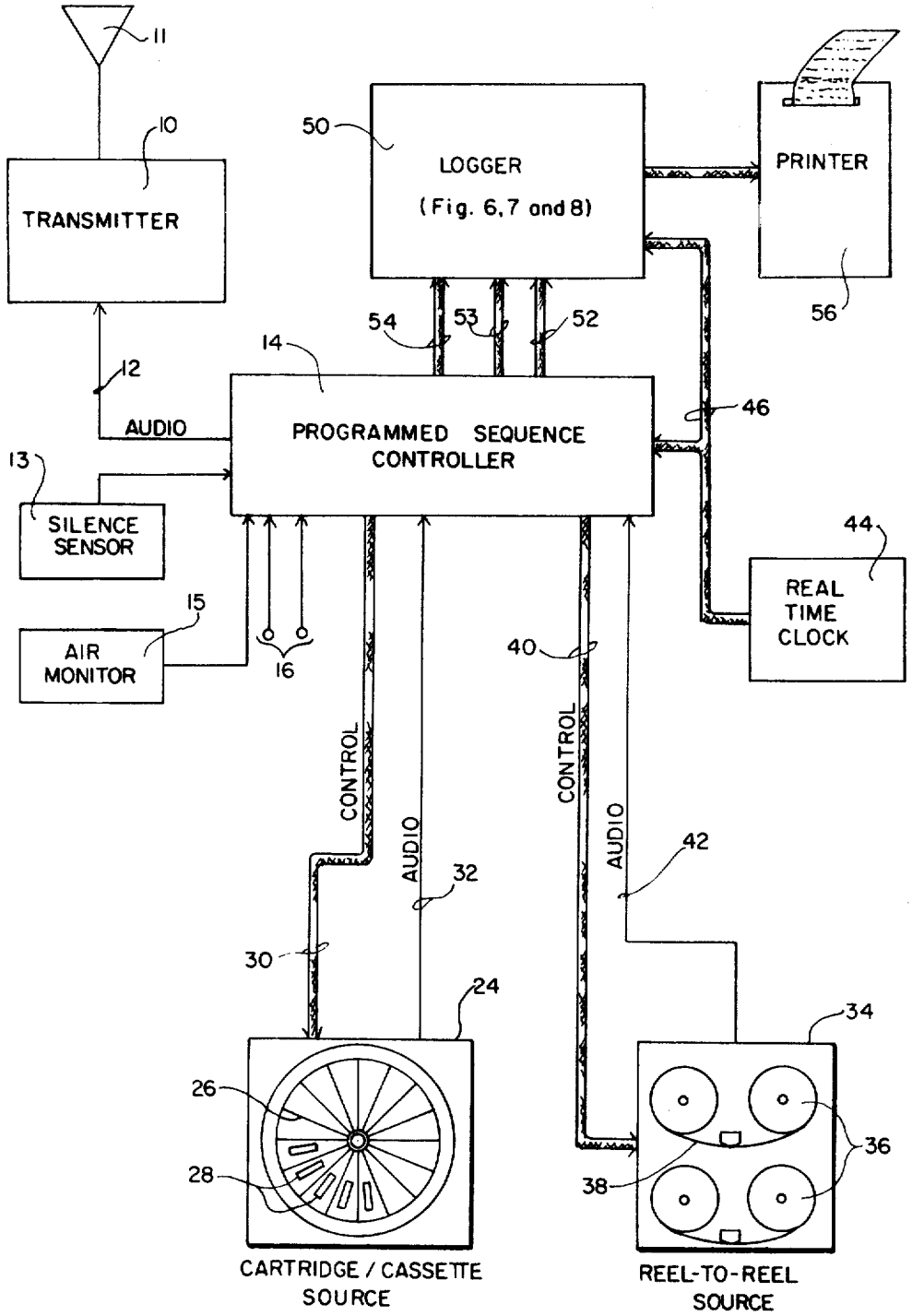

11
10
TRANSMITTER
50
LOGGER
(Fig. 6,7 and 8)
PRINTER
56
54
53
52
14
12
AUDIO
PROGRAMMED SEQUENCE CONTROLLER
46
13
SILENCE SENSOR
44
REAL TIME CLOCK
15
AIR MONITOR
16
40
CONTROL
AUDIO
42
32
30
24
34
26
28
36
38
CARTRIDGE / CASSETTE SOURCE
REEL-TO-REEL SOURCE

Fig.1

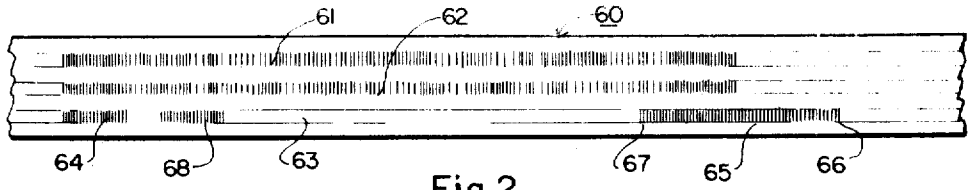


Fig. 2

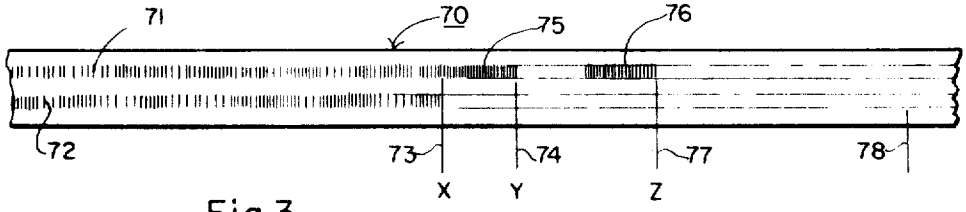


Fig. 3

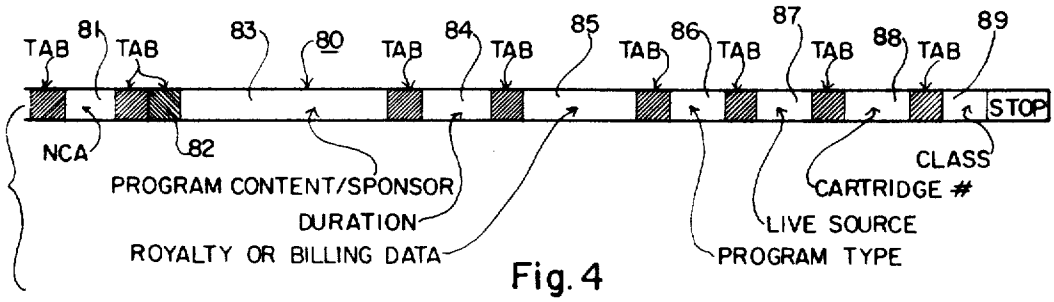


Fig. 4

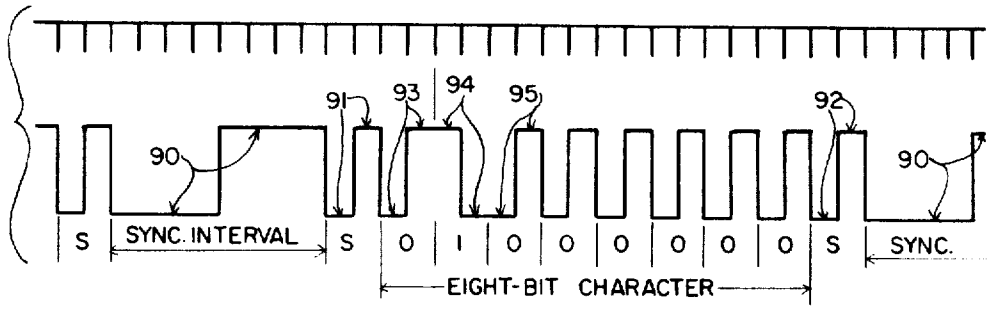


Fig. 5

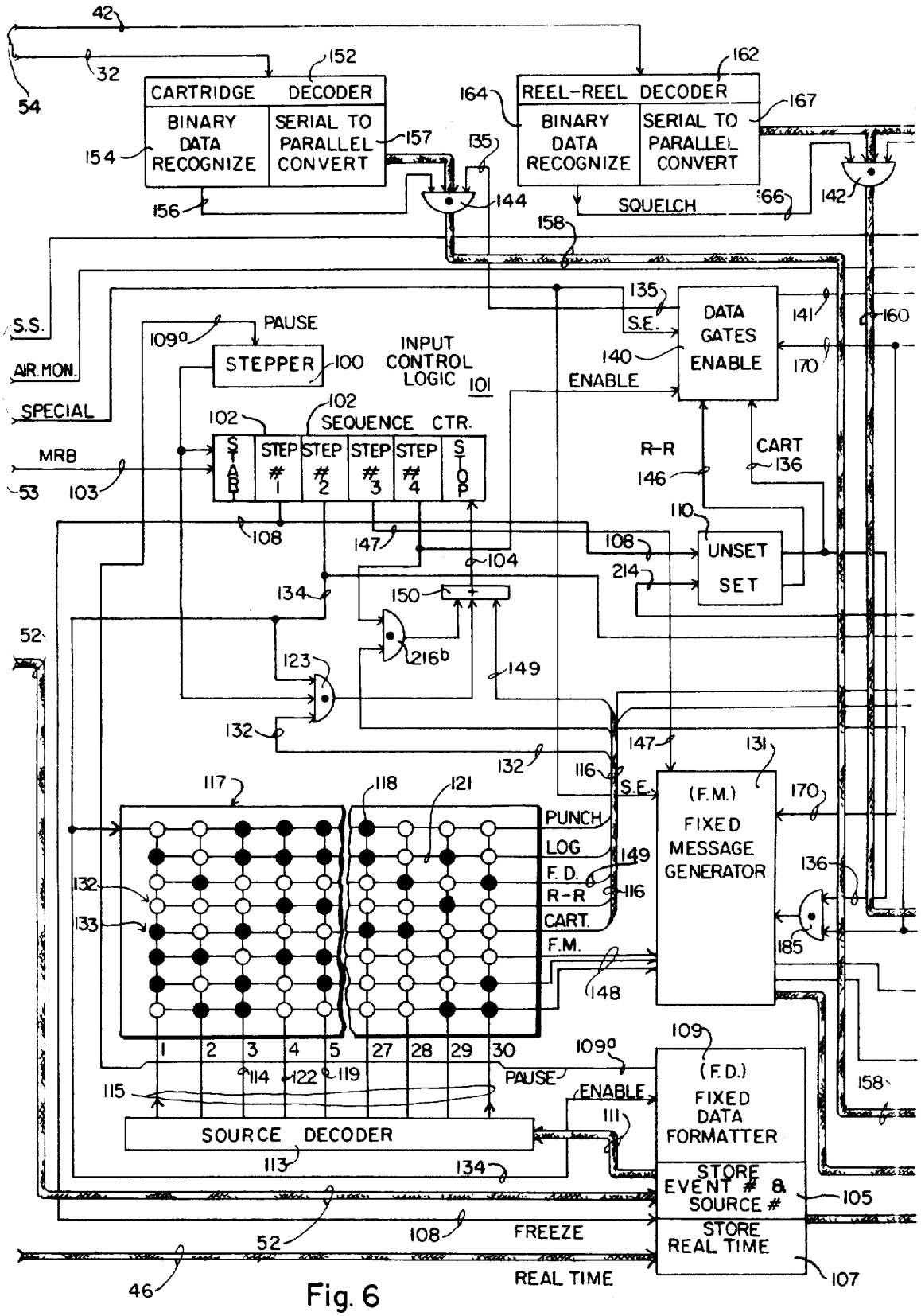

CARTRIDGE DECODER
BINARY DATA RECOGNIZE
SERIAL TO PARALLEL CONVERT
REEL-REEL DECODER
BINARY DATA RECOGNIZE
SERIAL TO PARALLEL CONVERT
SQUELCH
S.S.
AIR MON.
SPECIAL
MRB
PAUSE
STEPPER
INPUT CONTROL LOGIC
SEQUENCE CTR.
STEP #1
STEP #2
STEP #3
STEP #4
DATA GATES ENABLE
ENABLE
S.E.
R-R
CART
UNSET SET
(F.M.) FIXED MESSAGE GENERATOR
PUNCH
LOG
F.D.
R-R
CART.
F.M.
SOURCE DECODER
(F.D.) FIXED DATA FORMATTER
STORE EVENT # & SOURCE #
STORE REAL TIME
FREEZE
REAL TIME

Fig. 6

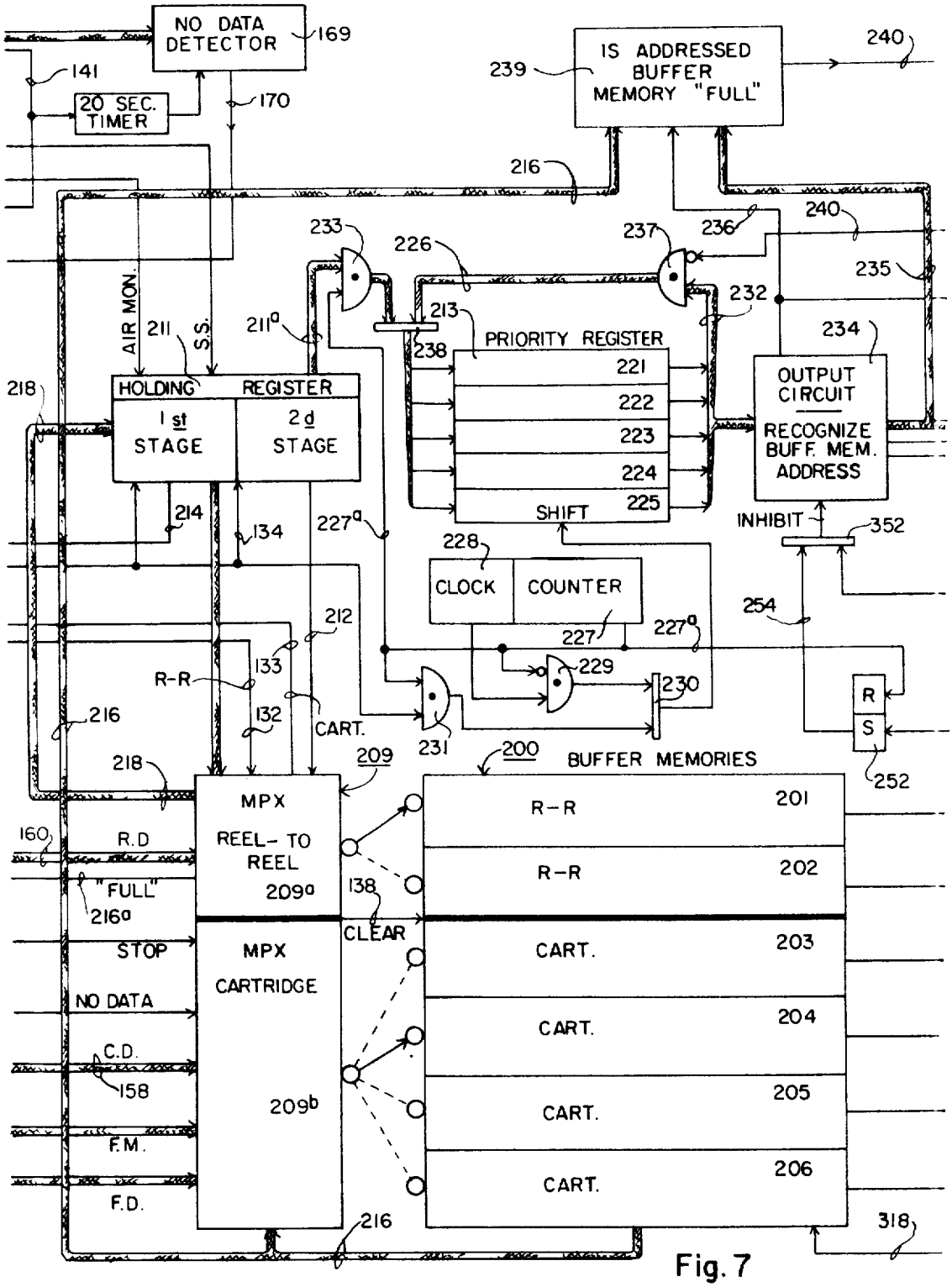

NO DATA DETECTOR
169
141
20 SEC. TIMER
170
IS ADDRESSED BUFFER MEMORY "FULL"
239
240
216
233
226
237
236
240
235
232
AIR MON.
211
S.S.
211a
213
238
PRIORITY REGISTER
234
218
HOLDING REGISTER
1 st STAGE
2 d STAGE
221
222
223
224
225
SHIFT
OUTPUT CIRCUIT
RECOGNIZE BUFF. MEM. ADDRESS
INHIBIT
352
214
134
227a
228
CLOCK
COUNTER
254
212
227
227a
229
230
133
R-R
132
CART.
231
216
218
209
200
BUFFER MEMORIES
R
S
252
MPX
REEL- TO REEL
209a
R-R
201
R-R
202
160
R.D
"FULL"
216a
138
CLEAR
STOP
MPX
CARTRIDGE
CART.
203
NO DATA
CART.
204
C.D.
158
209b
CART.
205
F.M.
CART.
206
F.D.
216
318

Fig. 7

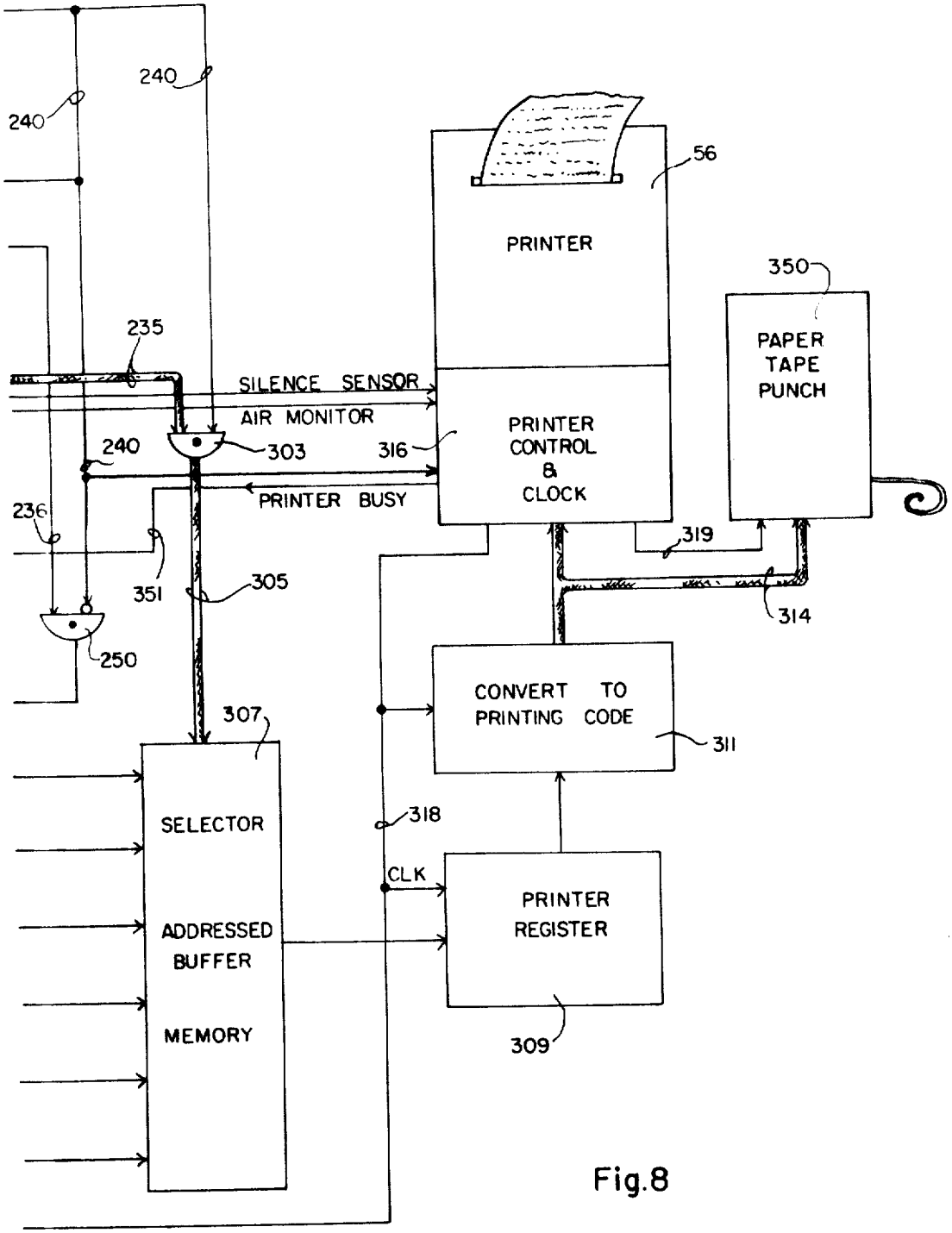

240
240
240
235
SILENCE SENSOR
AIR MONITOR
303
316
PRINTER BUSY
236
351
305
250
307
SELECTOR
ADDRESSED
BUFFER
MEMORY
318
CLK
PRINTER
REGISTER
309
CONVERT TO
PRINTING CODE
311
PRINTER
56
PRINTER
CONTROL
&
CLOCK
319
314
350
PAPER
TAPE
PUNCH

Fig.8

TIME	EVENT & SOURCE NUMBER	S.S.	AIR MON.	NCA	PROGRAM - CONTENT - SPONSOR	LENGTH	ROYALTY INFO OR BILLING INFO	TYPE	SOURCE	CLASS
10:59:55 AM	1001-111			ID	WWJQ - HOMETOWN MARYLAND				R	
11:00:00AM	1002-116				TIME ANNOUNCEMENT				R	
11:00:05AM	1003-413				LITTLE AL'S INFORMATION SHOW - 15 MIN.			E	L	PGM
11:00:12 AM	1004-323				TITLE - MUSICAL SELECTION		BMI- 3A35		R	
11:03:17 AM	1005-215			AAS	EYE SHADOW / GINGER PRODUCTS, INC.	30	OJKEO-011-1-229			CA
11:03:47 AM	1006-102			PRO	WWJQ STATION PROMOTION				R	
11:04:17 AM	1007-006				TITLE - MUSICAL SELECTION		ASCAB- 3A33		R	
11:07:00 AM	1008-518			AAS	WOMEN'S CLOTHING / B.Q. SHOPS, INC.	30	OJLO-9488-365			CA
11:07:30 AM	1009-322			AAS	FASTBUCK CARS / FASTSALES, INC.	60	OKO-2971-349			CA
11:08:30 AM	1010-017				TITLE - MUSICAL SELECTION		BMI - 4A66		R	
11:12:23 AM	1011-222			AAS	HEMAN FEEL / TROUSER CO., INC.	30	AOAD-5421-404			CA
11:12:53 AM	1012-202				TITLE - MUSICAL SELECTION		ASCAP-2J50		R	
11:15:00 AM	1013-117				CLOSING ANNOUNCEMENT	05				
11:15:05 AM	1014-180			AAS	WWJQ - NEWS / 1st NATIONAL BANK - 5 MIN.	30		N		CA
11:15:35 AM	1015-324				NEWS COPY					
11:16:55 AM	1016-225				SAVINGS / 1st NATIONAL	30				CA
11:17:25 AM	1017-223				NEWS COPY					
11:19:30 AM	1018-220				NEWS CLOSING ANNOUNCEMENT	30				CA
11:20:00AM	1019-001			AAS	TITLE - MUSICAL SELECTION		BMI-9B71		R	

Fig. 9

BROADCAST STATION LOGGER AND PRINTOUT SYSTEM

This invention relates to a system for logging and printing in natural language format a record of the entire content of the programs of a radio station, event-by-event, in the chronological order in which they are broadcast, the system having particular utility with respect to, but not limited to, the logging of the program content of automated broadcast stations. The disclosure also includes a novel way of cueing recorded sources with logging data.

Most of the radio programming which is broadcast at the present time is either pre-recorded or is taken from network lines, and only a small proportion of the programming is live. The recorded content is generally taken from tapes which are played by various types of automatic tape machines, including reel-to-reel tape transports and/or cartridge and cassette machines which automatically handle and play one of many stored cartridges or cassettes selected by addressing a particular machine to play whatever tape unit is stored at a certain one of its compartments or trays. These tapes usually have two or more recording tracks on them. For instance, the reel-to-reel tapes often have two tracks which can be used as right and left stereo channels or which, in a mono system, can have one selection recorded for play in one tape-motion direction and a different selection for play when the tape is driven in the other direction. Most cartridges, according to standards set by the National Association of Broadcasters, not only have audio tracks, but also have one additional and separate track known as a cueing track. Stereo cartridges therefore have three tracks. Both reel-to-reel and cartridge types of tape are used in broadcast stations, and these tapes are generally provided with "start" and "stop" signals which mark the beginnings and endings of the materials recorded on the tapes for the purpose of automatically controlling the tape machines at the proper instants. Usually reel-to-reel machines are used as sources of recorded music or lengthy pre-recorded programs, and since they usually do not have a separate cueing channel, the cueing signals are recorded in one channel, generally the left channel after the recorded material has concluded. However, where identification data is also included, it has been the practice to record the data over the audio in one channel using superimposed supersonic frequencies. On the other hand, the cartridge tapes are generally used for recording not only musical selections but most of the commercials, the station-breaks including the F.C.C. call letters and station location, the time signals, various special event messages and announcements, etc. Since the cartridge tapes have separate cueing tracks or channels, the cueing signals as well as the identification tags are recorded therein. It is the general practice in the industry to record these tags near the beginnings of the recorded materials which they identify. It is one object of the present disclosure to teach a technique wherein, with respect to the reel-to-reel two-channel tapes, these are cued and identified after one selection of the recorded material has been concluded, and before the next is commenced.

In automated stations, the present practice for control of the station, whatever the manner of cueing and identifying the tapes, is to have the cueing signals read from the tapes and delivered to some type of programmed control system, which in the case of an automated station takes the form of an automatic sequencer which automatically turns on the various sources from which the program material is to be taken according to a preset sequence, also switching the audio appropriately, and then changes to the next source in the sequence when the cueing signal of the preceding source indicates the end of the message. The automatic sequencer also receives real-time clock input from a clock source and interrupts the sequence at appropriate times, i.e. on the hour and the half-hour, for station breaks, time signals, weather summaries, and/or network materials. Automatic sequencers are in general use at the present time and are manufactured by several different companies to perform approximately as outlined above.

It is the principal object of this invention to provide an improved automatic system for accepting data from the various sources of material being broadcast, organizing it into the chronological sequence in which it actually went on the air, and printing a log of the material actually broadcast along with the real time at which the broadcast message commenced, such printing being in the form of the natural-spoken language as distinguised from a machine-language.

Another major object of the invention is to provide a system in which the real time sequence of broadcast is preserved in the log even though the identification tags on the tapes may be read into the system chronologically out of the sequence in which they were actually broadcast, it being noted from the above background discussion that, where for example a reel-to-reel tape selection is immediately followed by a cartridge selection which may even overlap it somewhat as in a "hard-rock" format of broadcast, it is likely that the tag near the beginning of the cartridge selection may be read at an earlier time than the tag which follows the preceding reel-to-reel tape selection, or it may even be read concurrently therewith. There are other ways in which the logger system may be fed data in a real time succession which differs from the actual broadcast sequence, but in any event this data must be temporarily stored, sorted out, and organized for printing in the correct real time sequence.

Yet another primary object of this invention is to provide a system which is able to keep up with a very fast paced broadcast sequence by faithfully printing all of the information from the various program-material sources without loss of information, while at the same time using a conventional printer whose printing rate is very much slower than the rate at which data characters to be printed are often read into the logger. Basically, the problem results from the fact that the information tends to enter the logger in bursts, even though there may also be relatively long times between such bursts during which no characters arrive, perhaps as much as three or four minutes while a musical selection is being played. In one practical embodiment of the invention the printer prints only ten characters per second, but the identification tags are read out at the rate of about 128 characters per second. Moreover, at certain other times in a program there are many such tags read out during a span of only several minutes, for instance where the station broadcasts in rapid succession several spot-commercials followed by station identification, followed by a series of "jingles" and "stingers" each of which only lasts for a few seconds but is identified by a 128-character tag which must be logged. This

invention employs a number of temporary buffer memory registers and logic circuitry for organizing the information and presenting it to the printer in the real-time sequence in which it was broadcast.

The data to be logged includes, for example, fixed data including real-time, event number, print control function and indication of source, i.e. whether network, studio, or tape machine and which one; and further includes variable data read from a tape source which is being broadcast to indicate the message content, i.e. commercial content and sponsor, or musical selection and licensing agency, A.S.C.A.P. or B.M.I., etc. Other information to be logged may also include certain fixed messages which are locally generated to indicate source, such as "studio," "network" identity, "time announcer," station identification when broadcast, nature of program content, i.e., non-commercial, news, commercial, special event, contingency, etc. A contingency mode covers unusual situations, perhaps temporarily affecting the station's ability to meet its obligations, such as a power failure, a failure of the broadcast transmitter, a special event interruption of the predetermined sequence, or a failure of a tape to deliver a proper cue signal, which failure is detected after a brief interval by a silence detector which advances the sequencer to the next event, etc.

It is another major object of the invention to provide the above improved logger and printer system in cooperation with improved means for tagging the tapes using a high-speed phase encoding which not only packs a very large amount of information into a short tape running time, about 128 eight-bit characters in less than one second, but also uses the optimum frequency range of the audio tapes and provides a type of modulation which is rather insensitive to variations in the play-back speed or amplitude output from the tape. Moreover, maximum recovery of information despite momentary dropouts in insured by providing a synchronizing signal at the beginning of each new character. Since a full 128 character sequence can be included within one second, it is not necessary to tag tapes which have no separate cueing channel by logging over the selections at sub-sonic or supersonic rates. The logging can be placed between selections, since there is conventionally more than one second separation therebetween.

Yet another major object of the invention is to provide means for printing out natural-language logs which: first, meet the FCC legal requirements pertaining to station identification records; second, provide proof to the sponsors that their commercials were in fact broadcast including the times thereof and the billing rates applicable; and third, keep full records of all musical selections played including their titles, royalties payable, and the licensing agency to which they should be paid. The system can be interfaced with a computerized book-keeping and billing system to complete the automation of the station.

Other objects and advantages of the invention will become apparent during the following discussion of the drawings, wherein: pp FIG. 1 is a block

showing a broadcast station including a logger and printer according to the present invention;

FIG. 2 is a drawing showing a typical three-channel cartridge tape with a cue channel recorded thereon;

FIG. 3 is a drawing showing a two-channel reel-to-reel or cassette tape with cue signals and tag signals recorded in its left channel;

FIG. 4 is a drawing showing the message format of the variable-data tag signals recorded on tape according to the present invention;

FIG. 5 is a drawing showing a timing pulse series located above a typical eight-bit character with synchronizing bits recorded by high speed phase encoding as taught by the present invention;

FIGS. 6, 7 and 8 when read together side-by-side comprise a block diagram showing in greater the components of the logger by which the various information is sorted out and presented chronologically to the printer; and

FIG. 9 shows a typical printout log prepared in accordance with the present system.

Referring now to the drawings, FIG. 1 shows the combination of a typical broadcast station and a logger and printer according to the present invention. The broadcast station includes a transmitter **10** coupled with a suitable broadcast antenna system **11**. The transmitter is fed audio on a wire **12** by a pre-programmed sequence controller **14** which in the present example will be assumed to comprise an automation system.

This programmed sequence controller receives input from a number of different audio sources, various types of which are shown in FIG. 1. The sources include input from telephone network lines **16** through a network switching means **18** which delivers network audio on the lines **20** to the program sequence controller **14**. The controller controls the network source lines **16** using its own internal control means. Another source of audio comprises a cartridge or cassette machine **24** which, for instance, may be of the popular "Carousel" variety including a rotating selection bin **26** having separate compartments or trays to hold tape cartridges such as the cartridges **28**. The source **26** is controlled by the program sequence controller **14** by way of the cable **30** which delivers input into the machine **24** to indicate which tray location is to be played, the audio then passing through the wire **32** into the program sequence controller where it is internally switched onto the audio wire **12** when that source is being selected for playing. Although a single cartridge machine has been illustrated at **24** in FIG. **1**, it is to be understood that there may be more than one, or there may be other types of multiple tape cassette or cartridge machines which perform a similar function, and these other machines are interchangeably usable in a broadcast system of the general type being discussed herein.

Another source of taped audio comprises the reel-to-reel machine **34** having individual tapes carried by reels **36**, each tape **38** being started and stopped by the control cable **40** extending from the programmed sequence controller, and the audio from the tapes **38** being coupled into the controller **14** on the wire **42** when a reel-to-reel machine **34** is selected. The broadcast station also includes a real-time clock **44** which delivers time signals on the wire **46** into the programmed sequence controller **14** and into the logger unit **50**.

The controller **14** can be one of any number of units currently available on the market for controlling broadcast stations automatically. For instance, Model AR 2000 manufactured by the Boradcast Products, Inc., is a unit which performs well in this particular setup. The controller of the type to which the present discussion

refers is a device which selects among the various sources such as the typical sources **16, 24,** and **34,** starting and stopping them and switching them at appropriate sequential times, and in addition indicating which of the various selections are to be played in the case of machines capable of playing a number of different recordings, such as the machine **24.** The program controller **14** ordinarily starts and stops the various sources in the sequence in which they are called for by a preset program, but the controller also can use the real time clock input on wire **46** to overide the sequence set within the controller and make station breaks at the correct real time, as well as perform other real time necessities such as joining the network lines at prescribed moments. The equipment described to-date is widely used in the broadcast industry and for present purposes is considered to be the prior art environment to which the present logger and printer system is applied.

The logger **50** receives binary real-time signals on the cable **46** as one of its inputs, but it also receives other inputs on the digital data line **52** coming from the programmed sequence controller **14.** This digital data includes the broadcast event number (sequential) as well as the identification of the source which has just commenced for broadcast. Moreover, the logger receives on the lines **54** the identification tag data taken from the audio channels of the various input sources, for instance from the tapes **38** or from the cartridges or cassettes **28,** whatever at the moment is being played. Finally, the cable **53** includes a group of control and sensor signals delivered to the logger from the programmed sequence controller for purposes which will become apparent during the discussion of FIGS. **6, 7,** and **8.**

In order to understand the manner in which the tapes are tagged, it is useful to discuss various typical tapes as currently used in the industry. Such tapes are illustrated in FIGS. **2** and **3,** in which FIG. **2** shows a typical three-track cartridge tape and FIG. **3** shows a typical two-track reel-to-reel or cassette tape. Referring particularly to FIG. **2,** the tape **60** used in typical cartridges of the type employed to record entertainment material as well as commercial and functional materials comprises tracks **61** and **62** on which the material is recorded, frequently in stereo. Ordinarily, the left-channel is on top in the track **61** and the right-channel is below it in track **62.** The tape also includes a third track **63** which is the cueing track, and the industry varies somewhat as to the manner in which cue signals are recorded thereon. However, perhaps the most typical type of cueing includes stop signals comprising a 1 KHz audio signal of about one second duration located at the beginning of each selection, which also serves to stop the tape machine when it reaches the leading edge of the corresponding cueing signal of the next selection. Moreover, near the end of each selection there is a 150 Hz end-of-message tone which usually lasts for about three seconds, this tone being used to control several different functions. The 1 KHz stop tone is labelled **64** in FIG. **2** and has a leading left-edge which can be used both to stop the present tape, and also to indicate the start of the next selection. The 150 Hz tone lasts about three seconds and is shown at **65** in FIG. **2.** The trailing edge **66** of this tone is used to kill the audio output from that tape machine just after the message ends as shown in the drawing by the termination of the signal in the tracks **61** and **62.** On the other hand, the 150 Hz end-of-message signal has a leading edge **67** which is available to start the next selection chosen by the sequence controller **14** just before the present message ends where overlap of the messages is desired. What has been described to date is prior art.

Between the two tone cueing signals in the track **62** there is a considerable span of time, except in the shortest of messages, in which the tape can be tagged as to the content of the message. Other manufacturers have used this space to tag the message using systems different from the one proposed for the present system, but in general the rate at which they have been able to put messages on the tape has been so slow that it has been difficult to get enough characters on the tape to tag a recorded message of brief duration, such as a spot commercial or a station break, and one of the advantages of the present system is the ability to place 128 characters on the track **63** within a span of one second running time of the tape. This tag according to the present invention appears at **68.** The tag **68** begins about 1.4 seconds after the stop signal **64** commences, the stop signal being located just ahead of the message recorded in the tracks **61** and **62.** The tag signal then lasts about one second, just long enough to get the 128 character format recorded thereon, the format being discussed hereinafter in connection with FIGS. **4** and **5.**

FIG. **3** shows a typical reel-to-reel tape **70** which has only two recording tracks, the upper track **71** serving to record the left-channel sound in a stereo system and the right-channel sound being recorded in the track **72** below it. There is no third cue track separate from the tracks **71** and **72** in this type of tape. The cue signal according to industry standards is generally recorded on the left-track **71** either superimposed upon the message near its end, or else right after the end of the message appearing in the track **71,** and according to industry standards comprises a **25** Hz tone **75** shown herein is beginning at **73** and ending at **74.** The beginning of the tone **75** at point *x* in the track is used to actuate the sequence controller to start the next source, and in the prior art systems the end **74** of the 25 Hz tone at point y is used to kill the audio from the present source. Usually there is a delay system in a present-day reel-to-reel machine which stops the tape just after the audio source is killed.

According to the present invention, the tag signal is applied just after the 25 Hz tone ends, and is labelled with the reference character **76** in FIG. **3.** As in FIG. **2,** the tag lasts for about one second, and therefore ends at the point *z* **77** just before the tape reel is actually stopped at **78.** In general, the delay in the machine is such that the tape actually stops moving about six seconds after the audio is switched off of the audio bus at point **74.** Since the same sudio head is also used to read the log contained in the tag **76,** the audio from that machine is switched by the controller **14** into the logger **50** so that the latter will receive the tag message **76** which is applied to the tape according to the invention as shown in FIGS. **4** and **5.**

Referring now to FIG. **4,** this figure illustrates a typical variable logging tag format, such as the tag **76** in FIG. **3** or the tag **68** in FIG. **2,** these tags giving the content of the message with which they are associated on tape, and other information as follows. The entire duration of the tag **80** shown in FIG. **4** is equal to or less than one second, and the tag contains the portion of the

information which is variable and which follows the first 28 characters which comprise the fixed data which, itself, does not come from the tape but from the clock 44 and the controller 14. The variable data from the tape includes the characters 29 up to 128, but these are not all evenly spaced on the tape. Instead, they are bunched up toward the beginning of the tag message on the tape so that they use only as much as the total character capability as is necessary to provide all of the information required for that particular tag. At the conclusion of each entry, the tag includes a tabulating character TAB which then advances the printer to the next column as will be described hereinafter in connection with FIG. 7 which shows a typical printout. The last character in the message is always a "STOP" character. In the present example, it is assumed that the printer 56 comprises a teletypewriter, and therefore the tag 80 illustrated in FIG. 4 is designed to cooperate with such a machine.

In starting a new line of print beginning with fixed data, at the beginning of the message there will appear a carriage return character, followed by a line feed character, followed by a first tabulating character TAB which then places the carriage in the right position to print the first series of characters to appear. After the fixed data is printed in the sequence to be described in connection with FIG. 6, then variable data appears as shown in FIG. 4, following a TAB character. This first variable data character group comprises the group NCA entered for the purpose of indicating whether or not the following tag refers to a commercial or non-commercial broadcast message. If it is a commercial message, the NCA column can be used to activate the automated billing system so that it makes an entry to take care of the billing for the commercial message. After the NCA character group concludes, there is another tabulating character which moves to the next column for the purpose of entering a series of characters indicating the content of the tape message in greater detail, for instance, the title of a musical selection or the content of a commercial message, etc. This message will appear in the space 83, but it may be preceded by a second tabulating signal 82 which can cause the content of the message to be indented. This satisfies a rule of the FCC with regard to logging which states in effect that where material is separately logged within a larger program, it should be indented on the log page so as to distinguish it and make it clear that the program material being entered was broadcast within a show whose title appears above. This might be illustrated by a playing of a musical selection within a disc jockey show which is listed at a heading located on an earlier line of the log. After the message has been entered in space 83 of the tag 80, there is another tab signal TAB which then moves the printer to the next column 84 which indicates the duration of the message in minutes or seconds, for instance, indicating that it is a 10 second commercial or it is a 30 minute variety show, etc. The entry 84 is followed by another tabulating signal TAB which moves the printer to the column 85 which contains billing material, this entry being used to indicate the name of the sponsor and the rate at which the program material should be billed. This portion of the tag is of course variable to suit individual billing procedures, but any event it is followed by a TAB which moves the printer to the column 86. In this column the program type is listed by encoded letters for showing what type of show the material was broadcast within, this column being required by the FCC and indicating among other things whether the show is an educational program, a news show, an entertainment show, etc. The next TAB character moves on to the column 87 which indicates whether the source of the show is live, recorded, etc. After the appropriate letter code has been entered in the column 87, the next TAB signal moves the printer to column 88 which can be used by the broadcaster for the purpose of entering such other data as he may wish concerning the source from which the material was taken. Finally, there is another TAB signal which moves the printer to the last print column of the present illustration, this column being required by the FCC to indicate the class of information contained within that portion of the tape to which the present tag refers. The class of material appears in column 89 and again includes a code made up of letters to indicate the nature of the content of the particular portion of the tape just broadcast. For instance, the letters C.A. indicate commercial announcement, and there are a number of other such designations as indicated by the FCC Rules and by useage in the broadcast industry. The information contained in the class column 89 differs from the information contained in the type column 86 to the extent that the type information is used to indicate the type of overall show in which the material appeared, whereas the class column is used to indicate the nature of the material specifically referred this by teis tag and constituting only a part of the show referred to in the type column. Of course, where the material referred to by the present tag is broadcast alone, and not as a part of a larger show, the type column will be blank. Likewise, when an entry on the log refers to an overall show rather than to a particular announcement or selection made during the show, then the class column may be left blank. Some of this discussion will be gone over again in connection with FIG. 9 which is discussed hereinafter.

Referring now to FIG. 5, this figure is used to describe the manner in which the tags are encoded upon the tags. Other manufacturers have in the past encoded tags upon the tapes, for instance, using FSK (frequency shift keying) encoding in which two tones are employed, one indicating a mark and the other indicating a space. This type of recording of the tags suffers from a number of difficulties, most serious of which is the slow speed at which the encoding is accomplished. Where audio tones are used, multiple cycles of each tone are required before the audio devices which sense these tones can operate. If about 5,000 cycles per second is used as the highest tone, this being a practical upper frequency because of limitations in response of a tape system, then it requires a considerable length of tape in order to record, for instance the 128 characters which are recorded using the present novel system. Moreover, two-tone encoding is sensitive to tape variations both with respect to speed of the tape and amplitude variations which invariably occur when using audio tapes because of the fact that their quality is not as good as digital tapes. The present system seeks to overcome these difficulties by using phase encoded direct-digital recording employing reversing square wave levels as shown in FIG. 5. FIG. 5 includes two related waveforms as illustrated, the top waveform showing 4 KHz timing marks which are accordingly spaced by ¼ millisecond. The square wave levels shown in the wave-

form below can change at any one of these timing marks. Each character to be recorded has 8 bits, plus a synchronization interval plus one synchronizaton character on each side of the eight bits. For instance, before each character begins there is a synchronization interval comprising 4 negative levels followed by four positive levels, the synchronization interval itself being labelled 90 in FIG. 5. Immediately following the synchronization interval 90 is a negitive-to-positive synchronization character 91, and this synchronization character is followed by eight information characters. These characters are finally followed by another negative-to-positive synchronization character 92. Each one of the information cycles comprises a two level signal according to standard Manchester encoding in which the transition from positive to negative comprises a binary one and the transition from negative to positive comprises a binary zero. Thus, in FIG. 5, the first character labelled 93 comprises a binary zero, whereas the next character, being from positive to negative, comprises a binary one and is labelled 94. The character 95 and each of the following characters comprises a binary zero since it is a transition from negative to positive. Thus, the character shown between the two synchronization characters 91 and 92 comprises eight bits as follows: 01000000.

These various level transitions occur so rapidly that they are themselves at an audio rate of 2 KHz maximum or 1 KHz minimum, and are therefore at a very excellent response frequency for most autio tapes. Accordingly, no carrier frequency is required. The present system puts 128 characters on the tape in one second, each character having not only eight bits comprising 16 different levels but also comprising two synchronization characters each having two levels and a synchronization interval including eight timing mark intervals as shown at 90. Thus, each character actually occupies 28 timing mark spaces of 250 microseconds each as shown in FIG. 5. There are various prior art teachings which appear to broadly resemble this technique but they are essentially digital recording techniques, i.e. as in U.S. Pat. Nos. 3,573,770 and 3,228,016 and 3,237,176, whereas the present technique allows a high speed digital waveform to be generated, recorded and recovered from a much simpler type of tape transport which is designed, not for digital recording, but for analog recording the audio range.

One of the big advantages of the type of tagging shown in FIG. 5, aside from its speed, is that it provides reliable recovery of the information even in the presence of tape anomolies such as splices, bits of dust, dropouts, etc. Naturally, where a dropout occurs the information which would have been in that portion of the tape is lost, however, in view of the fact that each character has its own synchronization interval with it, as soon as the signal from the tape is regained the characters are read reliably, instead of being lost because of loss of initial synchronization. Other advantages include immunity from tape speed variations due to the manner in which the waveform is regenerated, and immunity from the effects of tape said variation which adversely affect prior art frequency shift detection devices. The signal is filtered before recording, and then after recovery is filtered just enough to remove high frequency differentiating-kick components, and thereby the recovered signal is nearly sinusoidal. In this way high frequency components which tend to leak between channels of the tape are eliminated. This method of recording of the tags on tapes works very well on unequalized tapes as well as on equalized tapes.

LOGGER AND PRINTER (FIGS. 6, 7 AND 8)

FIGS. 6, 7 and 8 show a block diagram of the logger system which receives and organizes the information, and feeds it to the printer in the proper sequence for printing. There are several reasons why the information must be organized and temporarily stored in various memory buffers 200. In the first place, the information comes from several different sources, some of it comprising what was referred to above as fixed data which is taken partly from the programmed sequence controller 14, for instance the sequential event number arbitrarily assigned to the particular material being logged and the identification of the source of the program material, such as network, reel-to-reel source, or cartridge or cassette source; and the fixed data also including the time that the source went on the air as taken from the digital time clock 44. The information to be logged also includes information referred to above as variable data, this data format being shown in FIG. 4 and being taken mostly from the tapes themselves, for instance, from tags of the type shown in FIGS. 2 and 3.

A second reason making it necessary to organize and temporarily store the information to be printed resides in the fact that the printer cannot possibly keep up with the rate at which characters to be printed are received by the logger. The characters can arrive at the logger at the rate of 128 characters per second, but the printer can only print 10 characters per second. Sometimes there will occur three or four events in a row, each of which is very brief duration, but each of which requires the printing of an entire line as shown in FIG. 9. When this occurs, the printer may have more material than it can print in a minute or more all arriving at the logger within a relatively few seconds. Therefore, the logger shown in FIGS. 6, 7 and 8 includes in the illustrative embodiment six buffer memories which are not only accessible for loading fixed and variable data material thereinto from different sources, but which also serve to store the data and feed it in an organized manner to the printer as the printer is ready for it and in the chronological order in which the various events were broadcast.

A third reason for the necessity of organizing and temporarily storing the material to be printed resides in the fact that the material is not always read into a buffer to complete its contents in the same sequence in which its source was broadcast. It frequently occurs that a portion of the data to be printed concerning one broadcast event will arrive mixed up time-wise with data relating to another event which is currently being broadcast. In other words, the only information which arrives in the exact sequence in which the events were broadcast is the fixed data comprising the event number and identity of the source and the real-time at which the broadcast thereof began. The variable data taken from tags of the type shown in FIGS. 2 and 3 arrives at whatever times these tags are read into the logger from the various sources, and these real-time readings may be out of sequence with respect to the begin times at which the sources were actually broadcast.

In view of the fact that the difficulty involved in organizing the material so that each bit of data goes into the same buffer which is storing other data pertaining to

the same braodcast event is attributable to the mixing up sequentially of the various different sources, such as cartridge sources and reel-to-reel sources whose tags are not at the same locations on the tapes; the organizing and storing means shown in FIGS. **6** and **7** includes certain buffer memory registers **201** and **202** which store only data from reel-to-reel machines, and other buffer memory registers **203, 204, 205** and **206** which are connected so that they store only data taken from cartridge machines. The logger system also incluqes a priority register **213** serving to remember the sequential order in which the events were actually put on the air, and this sequence is used by the output logic of the system to deliver the data, on register at a time, into a final printer buffer which directly feeds the printer **56** to print the log shown in FIG. **9.** Thus, a number of buffer memories are provided which can be accessed selectively and non-sequentially for entering data, and can then be held for a sufficient length of time for the printer to catch up, assuming a sudden burst of input information. As pointed out above, there are long intervals of time during which no information is entered, for instance, during the playing of ordinary recorded musical selections. FIGS. **6, 7** and **8** when placed side-by-side form a composite diagram showing the logger and printer, the purpose of which is merely to record the events as they happen at the broadcast station under the control either of a human operator or of the programmed sequence controller **14** in an automated station as shown in FIG. **1,** and therefore the diagrams shown in FIGS. **6, 7** and **8** have no output except for the printed log sheet which is shown in FIG. **9.** However, the logger does have a number of inputs from the various station units shown in FIG. **1,** and these inputs all appear along the left-hand margin of FIG. **6.** Some of these inputs are taken from the sequence controller **14** and include data showing which sources originated the program material presently being broadcast, the event number, and other control and indicating signals as will be discussed below. The real time at which each event commences is taken from the time clock **44,** this data appearing on wires **46** at the bottom of FIG. **6.** There are two additional inputs **42** and **32** which appear in the cable **54** near the top of FIG. **6** and these inputs respectively come directly from the tag tracks of the reel-to-reel machines and of the cartridge machines. These two inputs differ from those appearing below them on the left-hand margin of FIG. **6** to the extent that the latter comprise fixed data, whereas the two top inputs comprise variable tag track data from the tapes themselves. Each time a new source of program material goes on the air, the system freezes in buffer **107** the time when it commenced as appears on the clock time bus **46,** and also freezes in buffer **105** the designation of that particular source and its chronological event number assigned by the program sequence controller **14,** this information appearing on the cable **52.** This data is used to establish the real time sequence in which the programs are to be logged. In FIG. **7** there appear six buffer memories **200** which comprise the registers **201** through **206** inclusive in which the data for each printed log is organized. The registers **201** and **202** never record anything except reel-to-reel source data, but the registers **203** through **206** inclusive record data from all other sources including cartridge sources. One of these buffer memories is selected for each new source by the multiplex circuit **209** each time such a source comes on the air. The holding register **211** contains two memory stages which remember the addresses of the particular buffer memories now being loaded from current sources, and these addresses are then passed on to the priority register **213** which comprises a sift register into which the addresses of the loaded buffer memories **200** are sequentially entered in the precise order in which the those sources went on the air. It is from the priority register that the output logic controlling the printing means is able to cause it to print the information contained in the various buffer memories in the exact sequence in which they went on the air.

As pointed out above, the factor complicating the logger circuitry is that the various sources do not necessarily read out their information in the same order in which they went on the air, and therefore, the various buffer memories will be receiving information non-sequentially. The circuitry shown in FIGS. **6** which serves the purpose of organizing the input of the data into the correct buffer memories **200** under the control of the input control logic circuit **101,** but it is the purpose of the output control logic **301,** shown in FIGS. **7** and **8** and operating independently, to retrieve the information for printing by sequentially removing the data from the various buffer memories **200,** one complete buffer memory at a time, in the sequence in which the various sources represented by those memories went on the air.

DATA INPUT TO BUFFER MEMORIES

The inputting of data to the buffer memories **200** is considered separately from a subsequent heading relating to the outputting of data from the buffer memories to the printer because of the fact that there is substantially no temporal relationship between the sequence in which the data is input to the memories and the sequence in which it is taken therefrom for the purpose of printing.

Each time the program sequence controller **14** in FIG. **1** starts up a new source, whether it be a special event, network, cartridge or cassette source, or reel-to-reel source, etc., the program sequence controller **14** puts out an MRB signay on wire **103** indicating a new source has just commenced, and this source is designated by an encoded designation thereof appearing on the calbe **52.** For instance, all of the reel-to-reel sources begin with a zero first digit, their second and third digits indicating which reel-to-reel machine was started, whereas for cartridge sources the first digit is not zero but indicates which cartridge machine was selected, and the second and third digits indicate which tray of that cartridge machine was selected. For instance, the designation **217** would indicate that it was cartridge machine No. **2,** tray **17,** that was just selected. Moreover, the real time appears on the cable **46** from the clock **44** and indicates real time in hours, minutes and seconds, AM or PM. The MRB signal **103** is delivered to the START of a sequence counter **102** and steps it to step No. **1** which delivers an output to actuate two temporary storage registers **105** and **107** appearing in the fixed data formatter **109.** Thus, the designation of the event number and the particular source just started is frozen in the register **105** and the real time is frozen in the register **107** and temporarily preserved, i.e. until the next MRB signal freezes new data into these registers. The source identifying data is also

delivered on cable 111 to a source decoder 113 which decodes the binary indication of the source which has just been put on the air and enables one of the wires in the group 115 going to a manually presettable plugboard 117. This plugboard has a number of vertical columns, one for each source represented by one of the wires in the bundle 115, and each respective column being energizable by the corresponding wire. For instance, if there are 30 different sources available on this plugboard, the decoder will energize the vertical column conductor attached to whichever one of these sources has just been put on the air. These sourses may for example be the various cartridge and reel-to-reel machines, as well as certain networks, time announcers, etc. These vertical columns, of which the column 119 is typical actually comprise electrical conductors which pass in near proximity to other horizontal row conductors, such as the conductor 121. There is a hole in the plugboard at each crossing so that when a metal plug is inserted in the hole it contacts that particular vertical column conductor and that particular horizontal-row conductor and connects them together. It is by means of this plugboard that station personnel can program in advance what is to be done by way of logging with respect to each of the individually selectible sources. For instance, the top row when energized serves to enable a punch tape machine, in addition to the teletypewriter printer, whenever that particular vertical column has a pin inserted in the top hole, whereby the information is not only printed in the printer but it also punchded upon a tape. This is convenient for the broadcast station because it gives a separate record for certain data, for example suitable for automatic billing of various clients. Thus, a time announcement source which is unsponsored would not have a pin in the top hole because nobody is to be billed for making the time announcement, whereas a commercial announcement taken for example from cartridge source 217, meaning cartridge machine No. 2, tray No. 17, is to be billed to a particular sponsor of that commercial announcement and therefore a pin should be placed in the top row corresponding with that particular source.

The second horizontal row on the plugboard 117 is used for indicating that the particular source is to be fully logged by taking the information from the tag track of the tape itself when a pin appears in the second row. The third row when including a pin indicates that fixed data only is to be logged, i.e. perhaps relating to a non-taped source for example, this fixed data merely including the time evencnumber and the source. This might for example be the case where a time announcement was made, and no other data need be logged because no one is to be either billed or paid royalities for the time announcement. The fourth row in this embodiment specifies that this is a reel-to-reel source, whereas the fifth row is used to specify that this is a cartridge source, and one pin will be inserted in the plugboard 117 if the source is indeed of either kind. A series of the other rows across the plugboard provide for a three bit binary indication of a selected one of several available fixed messages which are provided by a prerecorded fixed message generator 131. For example, one possible combination of pins in a column and intersecting several fixed message rows might designate one of the major networks, such as ABC, NBC, CBS or MBS, and the fixed message generator will then deliver a fixed message indicating that a certain network was on the air serving as that particular source. Other fixed messages include such possible indications as "time announcer," "power failure," "studio program," "special event," or other useful messages such as "no data," etc. Thus, each time a source is selected by the source decoder 113 and one of the vertical source wires is energized thereby, certain routine steps are called for by the plugboard depending upon pins which appear in the various holes, as will be further discussed hereinafter.

Each one of the buffer memories 201 through 206 inclusive comprises a register capable of accepting 1024 bits including data characters, appearing in a sequence which forms a message of fixed format. The first 16 of these characters comprising the fixed data are formatted by the formatter circuit 109 which sequences these first characters and reads them into whatever buffer memory 200 is selected by the multiplxer 209 at the beginning of a new source in a manner hereinafter to be explained. The first character in the format is taken from the top horizontal row of the plugboard 117 and is either a one or a zero depending on whether a pin is located in the top row or not. If there is no pin in the row, the first character is a zero indicating that the paper tape punch 350 will not be used to record this data source, but if there is a pin in the top row of the plugboard 117 the first character will be a one and teis will indicate that the tape punch 350 is to be used. The second and third characters are the hours digits taken from the temporary real time storage 107. The fourth and fifth characters are the minutes digits taken from the register 107, followed by characters six and seven which show the seconds, followed by characters eight and nine which register either AM or PM as may be appropriate, all taken from the real time storage 107 which shows the time frozen at the beginning of the present source selection. Characters, ten, eleven, twelve and thirteen comprise the event number in thousands, hundreds, tens and units taken from the temporary storage 105. Character thirteen is followed by the source number appearing as characters fourteen, fifteen and sixteen to indicate the identity of the source being logged. Both the event number and the source number come from the register 105. Finally, characters seventeen through one-hundred twenty seven are reserved for printing either the tag data taken from the tape on wires 32 or 42, or else for printing one of the various fixed meassages contained within the fixed message generator 131 as mentioned above during the discussion of the plugboard 117. Such a fixed message is printed right after the fixed data format, if called for by pins in the bottom three rows of the plugboard. The last designation entered into a buffer memory is always the "stop" signal indicating that this is the end of the message contained within that register, and the printer can therefore stop and become available for the printing of data contained in the next buffer memory to be sequentially printed under the control of the output control logic 301 which will be discussed in connection with FIGS. 7 and 8.

The discussion now turns to a sequential description of the manner in which the system performs the logging of each new source whose commencing is indicated by a new MRB signal delivered to the logger in cable 53 coming from the programmed sequence controller 14. This MRB signal appears on the wire 103 at the left-hand margin of FIG. 6 and actuates the sequence

counter **102** to move to step No. 1 and deliver an output serving to actuate the two temporary storage registers **105** and **107** to freeze the real time at which the new source commended, as well as the event and source numbers. At this point, the holding register **211** will still contain in its first stage the address of whichever buffer memory **200** was being accessed for the purpose of storing the data from the immediately previous source. If the previous source was a cartridge source, the data in the buffer memory should already be complete because the cartridge source has a separate cue track which is read off near the beginning of the selection in the cartridge. However, if the prior source was a reel-to-reel source, the data will not have been read from the previous reel at the time that a new MRB signal appears indicating the start of a new source, because the data on a reel-to-reel tape chronologically follows the program material. As stated previously, assuming that the first stage of the holding register **211** still contains the address of the buffer memory selected for the next previous source, this address comprising three parallel digits, in which the first digit will be a zero if it is a reel-to-reel source or a number if a cartridge source, it is therefore possible to determine by looking at the first digit in the first stage of the holding register **211** whether it is a reel-to-reel source or not. The step No. **1** output on wire **108** is therefore connected to a flipflop **110** which is clocked thereby so that the output of the first digit of the holding register on wire **214** representing the previous source will move the flipflop to a "set" condition if it is a reel-to-reel source or to an "unset" condition if it is a cartridge source. In this case assuming that the previous source is a reel-to-reel source, the data will not have been read into the associated buffer memory as of the present time. The discussion of the delayed entry of the reel-to-reel data into the correct buffer appears under the subsequent heading entitled "REEL-TO-REEL DATA ENTRY."

Each of the buffer memories **200** has an output from a status bit indicating whether that memory is full or not, these outputs going via the cable **216** to the multiplexer. In turn, the multiplexer has an output on wire **216*a*** indicating the status of the buffer currently selected by the address appearing in the first stage of the holding register **211.** The output on wire **216*a*** goes to an AND gate **135,** and if the source was a cartridge source, the gate receives an input from the "unset" output of the flipflop **110.** If the signal on wire **216*a*** indicates that the buffer memory is full, then no output will be delivered from the AND gate **135** to the fixed message generator **131,** this being true because wire **216*a*** indicates that the buffer memory has completed receiving the data from that cartridge and is "full." On the other hand, if the cartridge of the previous source has not delivered data to the buffer memory, this fact indicates a defective condition because that cartridge has already read out its tag data and it was not delivered to the buffer. Therefore the output of the gate **135** is used to drive the fixed message generator to deliver a "no data" output through the multiplexer into the buffer memory of the previous source, thereby completing the buffer memory to show that no data was in fact received from that particular source. This "no data" message is followed by a stop character which then completes the buffer memory by showing that it is full.

A stepper **100** is used to step the sequence counter **102** after it is started, and this stepper now advances the counter **102** to step No. 2 which will deliver an output on wire **134.** This output performs several functions. In the first place, it causes the content of the first stage of the holding register **211** to be shifted into the second stage of the holding register **211.** Both the holding register and the priority register **213** comprise at each stage five parallel bits, three of which hold the address of a particular buffer memory **200** containing data from a particular source, the fourth stage holds a bit indicating whether or not the silence sensor **13** has operated and the fifth bit holds an indication as to whether the air monitor **15** has concurred. These last two bits will be described hereinafter.

At the same time the content of the first stage of the holding register is shifted into its second stage, the second stage contents are shifted into corresponding five bits of the first stage of the priority shift register **213.** The shift of information out of the first stage of the holding register is followed by clearing of that first stage. The step No. 2 output of the sequence counter **102** on wire **134** is also used to enable the horizontal rows of the plugboard **117** thereby enabling their outputs for use by the fixed data formatter **109.** This fixed data formatter is also enabled by the output on wire **134,** and it steps through the first 28 digits of the format described above. As a result of the enabling of the rows of the plugboard **117** by the output on wire **134,** the rows **132** and **133** are both enabled. Therefore, one of the wires **132** or **133** enables either the upper multiplexer circuit **209*a*** if the new source is a reel-to-reel source or the lower multiplexer circuit **209*b*** if it is a cartridge source, and the enabled multiplexer then steps on to the next available buffer memory **200** of the appropriate type. When this buffer memory is located, its address is delivered upon the cable **218** into three digit positions of the first stage of the holding register **211.** Thus, at this point a buffer memory of the appropriate type has been selected and its address entered into the holding register's first stage. Now the system is ready to begin taking data from the tag on the source which was started up concurrently with the latest MRB signal. The purposes and functions of the holding registers and the priority registers will be further discussed hereinafter. Moreover, the manner in which the tag data from a previous reel-to-reel source is entered into the buffer whose address is now in the second stage of the holding register **211** will also be discussed below. Recapitulating, at this point a new MRB signal has just been received indicating that a new source has started up, and the event number as well as the number of this source and also the real time of its commencing are all contained within the registers **105** and **107.** The new source is also decoded by the decoder **113,** and in this example it will be assumed that it is a cartridge source corresponding with wire **114.** This source energizes the third vertical column of the plugboard **117.** The fixed data formatter, having been enabled by the wire **134,** reads out the digits of the fixed data into the selected buffer memory via the cable marked F.D. The first row crossing the wire **114** has a pin in it thereby entering a "punch" symbol as the first digit in the buffer memory. Also, since a cartridge contains information to be logged a pin will be in the second horizontal row indicating that logging is to be carried out. This source has more than mere fixed data and therefore there will be

no pin in the third row. The source is not a reel-to-reel source, and therefore, there will be no pin in the fourth row, but since it is a cartridge source there will be a pin in the fifth row. Since the cartridge source contains its own data, presumably no fixed message will be necessary in connection with this source, and therefore the succeeding three rows will all be empty. Conversely, if this had been a source requiring no logging of variable data, the "log" row would not have had a pin in it, and therefore, output on wire **149** in the cable **116** from the plugboard would have comprised a "stop" message to the sequence counter causing it to cease further counts and wait to start over again when the next MRB message is received. The fixed data formatter **109** also delivers to the selected buffer memory the remainder of the fixed data as described above including real time, event number, and source number. The fixed data formatter also delivers a "pause" signal on wire **109*a*** to disable the stepper **100** until the fixed data is all entered in the selected buffer memory.

CARTRIDGE SOURCE DATA ENTRY

The procedure for entering into the buffer memory **200** data from a cartridge source differs from the procedure for entering date from a reel-to-reel source, and therefore, they will be separately considered. The fact that there is a pin in the cartridge row of the patchboard, the fifth row from the top for the source enabled by wire **114**, causes the multiplexer **209*b*** to be actuated by the wire **133** to step through the appropriate buffer memories **203** to **206** to the next memory in sequential order, which memory is always presumed to be unused at the present time or perhaps to contain obsolete data relating to a source which has previously been fully logged. The multiplexer delivers the three bits indicating which of the buffer memories has been selected via the cable **118** into the first stage of the holding register so that it will contain the address of this particular buffer memory. Moreover, having selected this memory the multiplexer will put out a signal on wire **138** to clear the selected memory of whatever data it previously contained.

A program can be interrupted at any time for a special event, and therefore, when such an event occurs a signal will come true on the "special event" wire SE from the programmed sequence controller **14** in cable **53**. This special event wire is connected to a circuit **140** which is operative either to enable an appropriate data gate from a cartridge or reel source, or alternatively to block all such gates during a special event. There is a data gate **142** for controlling the flow of reel-to-reel tag data, and there is a data gate **144** for controlling the flow of cartridge tag data, and these gates are selectively enabled or blocked by the circuit **140** whose several inputs include the special event line SE and two inputs labelled **146** and **136** from the flipflop circuit **110** which indicates whether it was a reel-to-reel source or a cartridge source which was previously started up. Depending upon the indication furnished on wires **146** and **136** in the absence of a special event signal on the wire SE, either the AND gate **142** or the AND gate **144** will be enabled at one of their inputs. There is another enable wire to each of the gates **142** and **144** which will be discussed hereinafter.

On the other hand, if there is a special event input on the wire SE then the special event wire will block the enabling either of the gate **142** or of the gate **144** by disabling the wires **141** and **135** for the duration of the special event and actuating the fixed message generator to enter "special event" in the selected buffer memory **200**. Whichever type of event has just started, whether it be a special event or a reel-to-reel or cartridge source, there will be fixed data appearing in the fixed data formatter **109** and especially in the registers **105** and **107** containing the event number, the source, and the time that the source commenced. At this point, actuated by the wire **134**, the fixed data formatter **109** will read out the fixed data from the storage **105** and **107** into the multiplexer which will in turn enter this fixed data into the selected buffer memory. The precise format of this fixed data has already been described covering the first **18** characters entered into the selected buffer memory **200** in connection with the previous description of the patchboard **117**. The fixed data having been entered into the selected buffer memory and the special event wire SE still being unenergized, the system will proceed to step No. 3 of the sequence counter **102** as a result of the "pause" signal being removed from the wire **109a** by the fixed data formatter **109**. In step No. 3, a signal appears on wire **147** which, if no signal appears on the wire SE also entering the generator **131**, enables the fixed message generator **131** to deliver any fixed messages which may be called for by the plugboard **117**, namely the bottom three rows thereof whose outputs appear in the wire group **148**. These fixed messages cover a variety of selectible wordings, some of which have already been mentioned including the identifications of the various networks which can become sources, a time announcer, power failure, studio program, etc. These fixed messages, if any, as called for by pins in the plugboard are then entered through the multiplexer **109*b*** into the succeeding character positions of the buffer memory which has been chosen by that multiplexer. If there are no pins in the plugboard requiring a fixed message, the system does nothing until the sequence counter **102** moves on to step No. 4.

If there is no pin in the "log" row of the plugboard, after a required fixed message has been entered, nothing further is to be done, and a stop character from the fixed message generator **131** is entered through the multiplexer **109*b*** into the next character position of the buffer memory **200** and the logging of that source is complete. On the other hand, if after the fixed message has been entered, there is also tag data to be logged as indicated by a log pin in the second row of the plugboard **117**, then the data from the tag channel of that cartridge source is logged. It is also possible to have a pin in the third row of the plugboard **117** indicating that only fixed data is to be logged, and if this position has a pin in it, the logging will have been completed and a stop character written in the buffer memory following it. In this event, there will be an output on wire **149** from the plugboard cable **116**, and this output will pass through an OR gate **150** and stop the counter **102** via the wire **104**, indicating the log to be fully completed.

However, in this example it will be assumed, since it is a cartridge source as indicated by a pin appearing in the cartridge row of the patchboard **117**, that the data-gate enable circuit **140** will have been actuated by output on wire **145** from step No. 4 of the counter to enable the input **135** to the cartridge data-gate **144**. The appropriate variable tag data comes from the cartridge decoder circuit **152**, which does two things. First, the

decoder includes a circuit **154** which recognizes binary data appearing on the tag track audio line **32** from the cartridge tape, this recognition occurring whenever a new-character synchronizing signal interval **90** as shown in FIG. **5** appears on the wire **32.** Thus, each time a new data character is about to begin on the tape, the recognition circuit **154** puts out a squelch signal on wire **156,** this squelch signal comprising the other enabling input to the cartridge data gate **144** which is now fully enabled. However, the data coming into the cartridge decoder **152** on wire **32** is in serial form and must be converted to parallel form. Therefore, the other function performed by the cartridge data decoder **152** is to convert the serial data into parallel form, for instance, using a shift register as is well known in the prior art, and this converter **157** puts out the tag data in parallel-bit form to the data gate **144,** such data being passed therethrough to cable **158.** This data is then read out and entered into the selected cartridge buffer memory **200** through the multiplexer **209***b*. The data actually read from the tag track of the cartridge includes a "stop" character at the end of it, and when this stop character appears it is read into the buffer memory along with the other data and comprises the "full" entry in that buffer. As a result, the buffer provides a signal on wire **216***a* which is ANDED in the gate **216***b* with the counter output in step No. 4 to deliver a stop signal through the OR gate **150** and wire **104,** and the system then stops and waits for the next MRB signals to arrive.

REEL-TO-REEL DATA ENTRY

Going back to an earlier stage in the sequence of steps, when a new source is started up as indicated by a new MRB signal starting the sequence counter **102** and delivering output on the wire **103** to freeze the real time as well as the event number and the source number in the registers **107** and **105.** The source decoder **113** then decodes the frozen source designation on cable **111** and enables one of the wires extending vertically from it. In the previous paragraphs it was assumed to be the wire **114** representing a cartridge source. Suppose, however, that the new source is not a cartridge source, but is a reel-to-reel source as indicated by the enabling of the wire **122.** Typically, the plugboard **117** has a plug in the "punch" hole in the top row if there is data to be recorded, and it also has a pin in the "log" hole since there is data to be logged from the tape. There is, however, probably no pin in the "fixed data only"hole since variable data is to be recorded from the tape, but there will be a pin in the reel-to-reel hole in the fourth row since that is the kind of source assumed in this instance. Finally, there might be a pin in one or more of the fixed message holes.

In step No. 1 of the counter **102,** the output on wire **108** leaves the flipflop **110** unset because the previous source was a cartridge source, but this output also freezes the fixed data, real time, source number and event number of the new source. Moreover, the reel-to-reel output from the plugboard **117** on wire **132** actuates the multiplexer section **209***a* to select one of the two selectible buffer memories **201** or **202.** Since there are only two such memories the multiplexer first checks memory **201** to determine whether or not it is "full," again this determination being entered into the multiplexer by the wires **216.** If the buffer memory **201** is full, the multiplexer then checks buffer memory **202.** One or the other of these buffer memories should always be available in view of the fact that the reel sources are not expected to follow each other in rapid sequence in normal broadcasting, as is often the case with cartridge sources, which may include quick stingers and brief announcements or commercials sometimes appearing in very rapid succession. However, if both registers are full, then there is an abnormality and in order to prevent the system from being hung-up at this point the register A is arbitrarily selected and cleared via wire **138** from the multiplexer. The stepper **100** then steps the sequence counter **102** on to step No. 2, which energizes the wire **134.** Whichever of these registers is selected by the multiplexer, however, its address is entered in the first stage of the holding register **211** via the cable **218,** the holding register having just had its first-stage contents transferred to its second stage as a result of output on the wire **134.** Also, while still in step No. **2,** the sequence counter **102** also enables via wire **134** the fixed data formatter which then proceeds to enter the fixed data comprising the first 18 bits into the selected buffer memory, including time, event number and source number. However, as pointed out previously, the variable tag data will not be read from the reel-to-reel source until after the next succeeding source is started up. Therefore the step No. 2 output on wire **134** is ANDED in gate **123** with the reel-to-reel output on wire **132** and with the next stepper **100** output to send a pulse through the OR gate **150** and stop the sequence counter **102.** At this point, the data input system remains dormant while the reel-to-reel source plays its complete selection, but it is actuated by the next MRB signal entered into the system which again moves the counter **102** to step No. 1, thus energizing the wire **108.** This time, the wire **108** clocks the flipflop **110** to "set" condition because the address of the prior source was reel-to-reel as indicated by the first digit appearing on wire **214,** being a zero. The flipflop **110** therefore puts out an output on wire **146** which drives the enabling circuit **140** to enable the reel-to-reel gate **142.** The reason that this succeeding MRB signal is used to ultimately enable the gate **142** is that the presently running reel-to-reel source does not read out its variable data from the tag end of its track until after the next source has actually started. The reel-to-reel data appearing on the cable **160** is then entered through the multiplexer into the buffer memory **201** or **202,** whichever one has been selected by the multiplexer. This data is taken from audio channel **42** of the reel-to-reel source through the reel-to-reel decoder **162** which includes two functions: the first comprising a recognition circuit **164** for recognizing the synchronization interval **90** shown in FIG. **5** at the beginning of each character and putting out a squelch signal on the wire **166** which enables the other input to the AND gate **142,** and the second function being a serial-to-parallel data converter **167** which converts the code shown in FIG. **5** into parallel characters to be recorded in the buffer memory. As stated above the last character recorded in the data tag channel is a stop character, and this character is delivered when in the buffer memory **200** via the cable **216** to the multiplexer **209***a* to disconnect that buffer memory. When the enable data circuit **140** puts out a signal on wire **141** for enabling the aforementioned data gate **142,** the signal on wire **141** also goes to a 20 second timer whose purpose is to determine after that interval whether or not data has

actually been taken from the reel-to-reel source tag track or whether for some reason or other the data has failed to come through. If after 20 seconds no data has been recognized coming from the serial-to-parallel converter **167** as determined by integrating circuit **169**, an output appears from the circuit **169** on the wire **170** and this output is delivered back to the enable circuit **140** to close the gate **142**, and it is also delivered to the fixed message generator causing it to write a " no data" fixed message in the buffer register **201** or **202**, whichever is currently being addressed. Incidentally, since the next source will have started up before the data is read into the register **201** or **202** from the previous reel-to-reel source, the latter source will now have its address appearing in the second stage of the holding register **211**.

The important thing to notice is that, although the input control logic system has entered the data relating to any particular source which has been run into any one of the buffer memories assigned to that type of source, it has entered the addresses of those memories into the holding and priority registers in the precise chronological sequence in which the sources were run; and, conversely, that the output control logic **301** removes this information from the buffer memories one at a time in the same sequence in which the addresses of those registers are sequentially passing through the holding register stages and the priority register stages, which are about to be described. In this way, information can be randomly entered in various buffer memories **200**, even out of the sequence in which the sources were started, but it is always read out of these buffer memories by the output logic control **301** by selecting the buffer memories in the succession in which the sources were actually started as preserved in the priority register.

The holding registers **211** and priority registers **213** both have two additional bits in each stage, one of which is used as hereinafter explained to indicate whether the silence sensor **13** was actuated, and the other being used to indicate whether the program actually went on the air or not as determined by the air monitor **15**. The silence sensor **13** in FIG. **1** is contained within the programmed sequence controller. This sensor monitors the audio channel **12** going to the transmitter and is responsive to periods of silence exceeding three seconds after a new source starts up, such silence being attributable to a variety of sources, for example, such as a broken tape. The silence sensor signal appears on the wire SS and is delivered directly into the holding registers first stage to access the silence sensor bit by entering a high signal therein when silence on the audio channel is sensed. Likewise, the system includes an air monitor **15** shown in FIG. **1** and comprising a separate receiver which actually receives the broadcast program of the station through the air. If the station fails to broadcast the subject matter of the present source, the air monitor will detect such failure and will put out a signal on the wire labelled Air Mon, and this signal will be fed directly into the appropriate bit position of the first stage of the holding register **211** to raise the level of the air monitor register bit thereby indicating such failure. These two bits are transferred along with the address bits through both stages of the holding register and then into the priority register where the output logic will recover them as will be described shortly.

DATA OUTPUT FROM MEMORIES TO PRINTER

As pointed out above, there is very little relationship between the time when the output control logic **301** takes the contents of a buffer memory for the purpose of printing it, and the time when the input control logic **101** loads the buffer memory. Generally speaking, a buffer memory is loaded whenever the information which belongs in that memory is being read off of a tape track as tag data or when it is emanating from another source such as the fixed data formatter **109** or the fixed message generator **131**. Conversely, a buffer memory is read out to the printer whenever the printer has completed printing of the data taken from the next previous buffer memory and whenever the next buffer memory is actually ready for readout because it is tagged "full."

The priority register **213** actually includes five parallel shift registers **221** through **225**, each having eight successive bit positions. The first three parallel bits are used as the addresses of the buffer memories **201** through **206**, the fourth bit is the silence sensor bit and the fifth bit is the air monitor bit. All five of these registers are circulated through a return loop **226**, and the writing into these registers, the reading out of their content, and the eliminating of data which is obsolete all take place incident to the circulation of their content. The stepping of these registers **213** through their eight positions is controlled by the clock **228** shifting the register through the AND gate **229** and OR gate **230**. The clock **228** also pulses a divided-by-sixteen counter **227**. The first eight counts of the clock **228** usually circulate the registers **221** through **225** completely through their eight bit-positions starting in an initial position and ending in the same position so that the data in the 5 parallel registers all shifts to the right through the loop **226**. After these first eight counts, 0–7 in the counter **227**, an output comes true on wire **227*a*** in the last stage of the counter which signal persists for the next eight clock pulse counts 8–15, and this output blocks the AND gate **229** causing the priority register **213** to stop shifting and pause for eight counts. Thus, the registers **213** alternately shift for eight clock pulses and then pause for eight clock pulses.

During the pause interval of **8** clock pulses when the wire **227*a*** is true, the AND gate **231** is enabled as well as the AND gate **233** so that new parallel date from the dable **211*a*** can pass through the AND gate **233** into the left stages of the registers **213** via the OR gate **238**, and be clocked into the first stages of the register **213** by the next pulse on wire **134** which also actuates the holding register **211** stages to shift right. This pulse enters through the AND gate **231** and the OR gate **230** and shifts the registers **213** one position to the right. Because of the above sequence in which data is entered and because of the way in which data is deleted from the registers **213**, as will presently be discussed, after it is read out to the printer system, the first data positions of the register **213** are empty, and the remaining data in the register **213** is crowded toward the left-hand end thereof.

New data is read into the register **213** only while it is in a pause state, the AND gate **229** being blocked. Conversely, data in the right-most occupied bit position of the register **213** is only read out to the output circuit **234** during the eight clock pulse intervals between pauses when the AND gate **229** is not blocked and the

register 213 is circulating through the loop 226. During these 8 clock pulses the data shifts right, and since it was initially crowded toward the left, several shifts usually occur until an occupied bit position is recognized by the output circuit 234, which recongizes an address in the register 213 because not all five register bits are zeros. When an address is recognized, an output on wire 236 actuates the circuit 239 and the address is delivered from the circuit 234 to the circuit 239 which compares it with indications appearing on the wires in the cable 216 to determine whether or not the corresponding buffer memory 200 is tagged "full." If the address corresponds with a cartridge source, the buffer memory should already be full, but if the address corresponds with a reel-to-reel source, then the addressed buffer memory may still be waiting to be filled. If it is tagged "full", an output appears on wire 240 and enables the AND gate 303, and the address is delivered from the wires 235 via the wires 305 to the selector circuit 307 which serves the purpose of selecting that particular buffer memory and passing its content through to the printer register 309, which is the last register to hold the data prior to actual printing thereof. The output on wire 240 also actuates the printer control circuit 316 to deliver a "printer busy" signal on wire 351. Moreover the output on the wire 240 also blocks the AND gate 237 during that one clock pulse interval and thereby momentarily interrupts the recirculation loop 226 so that the data in that position of the register 213 is lost and its position in the shift register becomes all zeros. On the other hand, if the particular buffer memory register 200 which is being addressed is not yet "full," as may very well be the case where a reel-to-reel source has not yet finished playing the material recorded on the tape prior to the data tag, then the wire 240 fails to come true to enable the gate 303. The output on wire 236 when unaccompanied by output on wire 240 actuates AND gate 250 to set a flipflop 252 which puts out an output on wire 254 through the OR gate 352 to inhibit the recognition circuit 234 for the remainder of the eight shifts and until the next pause signal on wire 227*a* resets the flipflop 252, which thereby permits the register 213 to go on shifting to the right through the remainder of the eight positions until it returns by circulation to its initial position, where it pauses for eight clock pulses. After the pause the circuit 239 tries again as outlined above to find that same buffer memory "full" during the next recirculation. This continues until that buffer memory is tagged "full," and then the gate 303 is enabled so that the content of the selected buffer memory is transferred to the printer register 309. When eventually the transfer is made, the signal on the wire 240, which is of one clock count duration, blocks the AND gate 237 for that one count, thereby deleting the just-used address from the circulating data in the priority register 213.

Each time an output appears on wire 240, the printer puts out a signal on wire 351 indicating that it is busy and cannot accept more data, and this output is introduced through the OR gate 352 to inhibit the recognition circuit 234 and cause the addresses in the priority register 213 to keep recirculating without effect until the printer is ready for the next source-data to be taken from a buffer memory.

Going back to the situation where the memory 200 whose address appears at the AND gate 303 is tagged "full," the selector circuitry 307, being a simple switching arrangement, switches to the addressed buffer memory 201 through 206 and thereby couples the output of that addressed register into the memory 309. This register then retains the data to be printed until called for, at which time a converter 311 converts this data to the proper encoding for the particular printer machine being used. This printer may typically be of the teletypewriter variety, although not necessarily, and in the particular embodiment currently manufactured it comprises a printer made by EIA, Electronic Industries Associates, which is a standard type of machine requiring eight parallel input lines 314 containing encoded data.

The printer can accept data from the converter 311, or from the last two bit-positions of the priority registers including a silence sensor bit and an air monitor bit. However, the necessary functional information such as line feed, tabulating signals, punctuation, and stop signals are generated in the printer control circuit 316 which includes a locally clocked counter, also delivering clock signals on wire 318 to the printer register 309 to clock its output. The printer control 316 uses a fixed internally-sequenced printing format as follows:

The printing format in its first step takes from the printer register 309 its first data character indicating whether or not to also turn on a paper tape punch machine 350. If so, it outputs an enabling signal on wire 319, and the paper tape punch machine then records data from the converter circuit 311 appearing on the wires 314. The printer control 316 then locally generates a carriage return and a line feed signal. Next, it clocks the two hours characters from the printer register 309, locally inserts a colon, clocks the two minutes characters from the register 309, inserts another colon, and clocks the two seconds characters followed by AM or PM into the printer. The printer control 316 then locally generates a TAB signal which moves the carriage to the next column, whereupon it takes the four characters representing the event number from the printer register 309 and prints them, followed by a locally generated dash, followed by the three characters representing the source number which it clocks from the printer register 309. Next, it locally generates another tab signal which moves the carriage to the next column position. In this column position, the print control checks the silence sensor bit taken on wire SS from the output circuit 234 of the priority register 213, and it either enters an X or leaves this column blank. It then locally generates another TAB signal and moves on to the next column, wherein it checks the AIR MON.bit taken from the output circuit 234 of the priority register 213, and again either enters an X in that column or leaves it blank, depending upon whether the program has failed to be broadcast, or not. If the printer is so equipped, a failure as indicated by an X in the AIR MON column can also shift the printing ribbon to red. The printer control 316 then generates another internal TAB signal, and proceeds then to clock out the variable data or fixed message data content remaining in the printer register 309 until it is all read out and printed. At this point, the "printer busy" signal disappears from the wire 351, and the priority register circuitry 213 begins searching for the chronologically-next buffer memory address to start the process all over again.

Referring now to FIG. 9, this figure shows a page of a log printed out according to the present invention to show a sequence of typical program events. The events

listed in the first two columns on the left are so-called fixed data events, fixed in the sense that they are not taken from the tapes themselves, but instead are taken from fixed circuitry including an event counter located within the programmed sequencer **14** and indicating the events in the sequence of their occurrence. The illustrated log in the first column lists the real time taken from the digital clock **44**. In the second column it lists the events 1001 through 1019. Next to each event listing there is a dash followed by a three digit number indicating the source which the sequencer has enabled in order to deliver that event. The source listing is three digits, of which the first indicates the source machine itself and the second and third digits indicate the particular position within that source. For example, sources listed as **101+** are the station's own identification tape also including time announcements, whereas the source **401** may be the fourth cartridge machine, other machines being represented as sources whose first digit is 0, 2, 3, or 5. Thus, the material in the first two columns of FIG. **9** comes from the sequencer **14** itself. The material appearing in the third column is from the silence sensor **13** and will comprise either an X or a blank. The fourth column is the air monitor column which also will either be blank or else include an X to indicate a failure. The material appearing in the other columns to the right of the first four columns comprises material from the fixed message generator **131** or from the tape tags, for instance, as shown in FIG. **4**. The column **91** corresponds with material taken from the tape position **81** shown in FIG. **4**. This column is headed with the letters NCA and serves to indicate the type of program for billing purposes. In the event that the tag which is read from a tape is to actuate an automatic billing machine, the information listed in the column **91** can also serve to turn on an automatic billing machine to take down the entry for billing purposes. On the other hand, if the NCA column **91** is blank then the billing system will remain dormant, and the information will simply be printed in the logger.

The column **92** corresponds with the tag position **83** and states the content of that portion of the program. Moreover, if it is sponsored content, the name of the sponsor is printed in the log after a slant bar. This portion of the message is of course variable in length. It always starts, however, at one of two possible positions in the column **83**. The TAB signal appearing right after the position **81** of the tag in FIG. **4** moves the printout carriage to the position just within the column **93**. However, if the tag also includes a TAB signal in the position **82**, then the material in the column **93** will be further indented, for instance, as shown in the 3rd through 12th rows in the column **93**. Such indentation indicates that the material printed therein is part of the unindented program located in the column just above, for instance in the third row in column **93**. After the program content material and possible sponsor's name have been printed, the next column **94** includes a two-digit number indicating the number of seconds of duration of the message which is located in that particular row. In the fifth row, the eye-shadow commercial is 30 seconds long. However, it should also be noted that the 15 minutes referred to at the end of the third entry in column **93** indicates in minutes the duration of that whole program including the individual program events indented thereunder. Column **95** serves to list for billing or crediting purposes the various events of the show which require either billing or else the payment of royalties. For instance, in the fourth row a musical selection is played, and the licensing agency for that particular selection is BMI. The billing information is represented by some arbitrary code illustrated by the indication 3A35. Thus, the musical selection played will be automatically listed in such a way as to facilitate the payment of royalties due for putting that musical selection on the air. Conversely, on the 5th line in column **95** there is indicated a code showing the sponsor and the billing rate for putting that particular commercial on the air. In this way, all information required for billing a particular client is contained on this one printout.

Column **96** satisfies an FCC requirement that the type of show should be designated in the log, and for this purpose the talk-show listed on the 3rd line including the items indented thereunder is listed as educational, using the letter E, whereas the news show listed on line **14** is designated as a news broadcast by the letter N. The source column **97** provides an entry of either the letter R representing recorded material, or the letter L representing live material.

Finally, the column **99** is also provided to satisfy an FCC requirement and indicates the class of event given, for instance, it being a live program event PGM or a commercial announcement CA.

The above entries are of course merely illustrative of the type of material which can be entered into a log, and this typical printout can of course be varied either by adding the information or omitting certain items as is required to suit the needs of a particular station. Present working embodiments of the system have a 128 character capability, whereas the amount of information shown on the most crowded line of the previous printout still shows only about 60 characters.

The present invention is not to be limited by the illustrative embodiments, since these embodiments can be varied within the scope of the following claims.

I claim:

1. A system for logging data relating to materials which are programmed to sequentially emanate from plural sources, the sources being identified by data and commencing their materials at successive real-time moments which are also identified by data, and some of the sources, reading out tag data concerning their materials, the system comprising:

a. plural buffer memory means each capable of storing the data to be logged with respect to one source;

b. buffer-input multiplexer means operative when actuated to select an available buffer memory means;

c. priority register means;

d. input means responsive to the commencing of a new source to actuate the multiplexer means to select a buffer memory means, to enter real-time data and source identification data therein, and to store in the priority register means the address of that buffer together with previously-selected buffer addresses chronologically in the sequence of source commencements;

e. means for entering in the selected buffer memory means any tag data read out from the corresponding source;

f. means for logging the data which is stored in the buffer memory means; and

g. buffer output means operative to couple to the logging means the data from the buffer memory means

whose address appears chronologically next in said priority register means.

2. The system as set forth in claim 1, wherein said input means and said entering means also include means responsive to the completion of input of all data concerning a particular source into its selected buffer memory means to tag the latter "full;" and wherein said logging means includes means for indicating when it has completed logging of all data stored for a previous source; and the buffer output means is responsive to the logging means having completed logging of the data concerning the previous source and to the next source being tagged "full" to couple the buffer memory means corresponding with the next source to the logging means.

3. A system for providing a printed log of program materials which are actually boradcast by a broadcast station, wherein the logging system is supplied with data identifying the various sources and indicating the real times at which each commenced and wherein at least some of said sources comprise recorded program material including tag data read out either during or after the program material, the system comprising:

a. first and second data receiving means, the first means being connected to accept data from sources which read out their data after the program material and the second means being connected to accept data from sources which read out their data during the program material;

b. multiple first and second buffer memory means respectively connectible to said first and second data receiving means for storing data to be logged and relating to a time of commencement, the source, and the identity of the materials relating thereto;

c. first and second buffer-input multiplexer means, the first multiplexer means being operative when actuated to select one of said first buffer memory means and connect it to receive data from the first data receiving means, and the second multiplexer means being operative when actuated to select one of said second buffer memory means and connect it to receive data from the second receiving means;

d. input-logic means operative in response to the commencement of a new source to actuate the appropriate multiplexer means to select a buffer memory means and to enter the time of commencement data and the identification of source data therein;

e. priority register means operative to receive the address of each buffer memory means as it is selected in response to the commencement of a new source and to preserve these addresses in the chronological order of said commencements;

f. printout means for printing data stored in said buffer memory means; and

g. buffer-output logic means responsive to completion of printing of data from one buffer memory means for selecting for output to the printout means the buffer memory means whose address appears chronologically next in said priority register means.

4. The system as set forth in claim 3, including means for manually presetting which data is to be input into the buffer memory means for each of the possible sources of broadcast material and comprising, means for decoding source identifying data when a new source commences and for energizing one input to said presetting means corresponding with that source; manually selectible means connected to each of said inputs and operative to select the various types of data available to be entered in the buffer memory means selected for that particular source, the selectible data comprising fixed data including time and source data, and comprising variable data including recorded tag data.

5. The system as set forth in claim 4, wherein said sources include various recording playback means, network program sources, studio sources, time announcer and special event sources, and some of these sources have no tag data associated therewith; a fixed message generator operative to generate fixed-message data descriptive of various materials and sources; and said manual presetting means being operative when actuated to select one of said fixed messages to be entered in the buffer memory means together with fixed data.

6. The system as set forth in claim 5, including timer means started by the commencement of a new source and timing an interval within which tag data should be received, and means responsive to failure to receive tag data within said interval to actuate the fixed message generator to enter a no-data message in the buffer memory means selected for that source.

7. The system as set forth in claim 5, wherein said fixed message generator includes the capability of generating data identifying networks acting as sources, and local sources such as a studio source, time announcer, and special event sources; and said manual presetting means initiating the generation of fixed messages appropriate to these sources.

8. The system as set forth in claim 5, wherein said manual presetting means comprises a crossed conductor plugboard in which the conductors in one direction represent various possible sources and the conductors crossing them in the other direction respectively represent the various selectible data that can be entered into the buffer memory means.

9. The system as set forth in claim 4, wherein said broadcast station includes a silence sensor operative to deliver a failure signal responsive to failure of audio supplied from a source, and further includes an air monitor operative to deliver a failure signal responsive to failure of the broadcast station to actually transmit material from a source, said failure signals comprising additional data to be logged, and the system having storage means for storing such failure signals and accessible to the printout means for logging such failure when logging other data relating to the same source.

10. The system as set forth in claim 4, wherein the manual presetting means includes means indicating a source in which the tag data is read out after the program material and means responsive thereto for actuating the first multiplexer means to store that data in a first buffer memory means, and the system storing all data relating to other sources via the second multiplexer means in the various second buffer memory means.

11. The system as set forth in claim 10, including means for tagging each buffer memory means "full" when the data relating to the source for which it was selected is completely entered therein; and said output logic means including means for sequentially advancing the buffer memory addresses contained in the priority register means and checking the corresponding buffer memory means to determine when the sequentially-next buffer memory means is tagged "full;" and means

to delay selection for output to the printout means of the sequentially next memory means until it is tagged "full."

12. The system as set forth in claim 11, wherein said priority register means is a circulating loop shift register, said means for scanning the buffer memory addresses including means for circulating the addresses therein and for opening the loop to delete an address when the corresponding buffer memory means has been read out for printing of its contents.

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