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Oct. 9, 1956 A. D. HOFFMANN 2,766,374

SYSTEM AND APPARATUS FOR DETERMINING POPULARITY RATINGS OF DIFFERENT TRANSMITTED PROGRAMS

Filed July 25, 1951 2 Sheets-Sheet 1

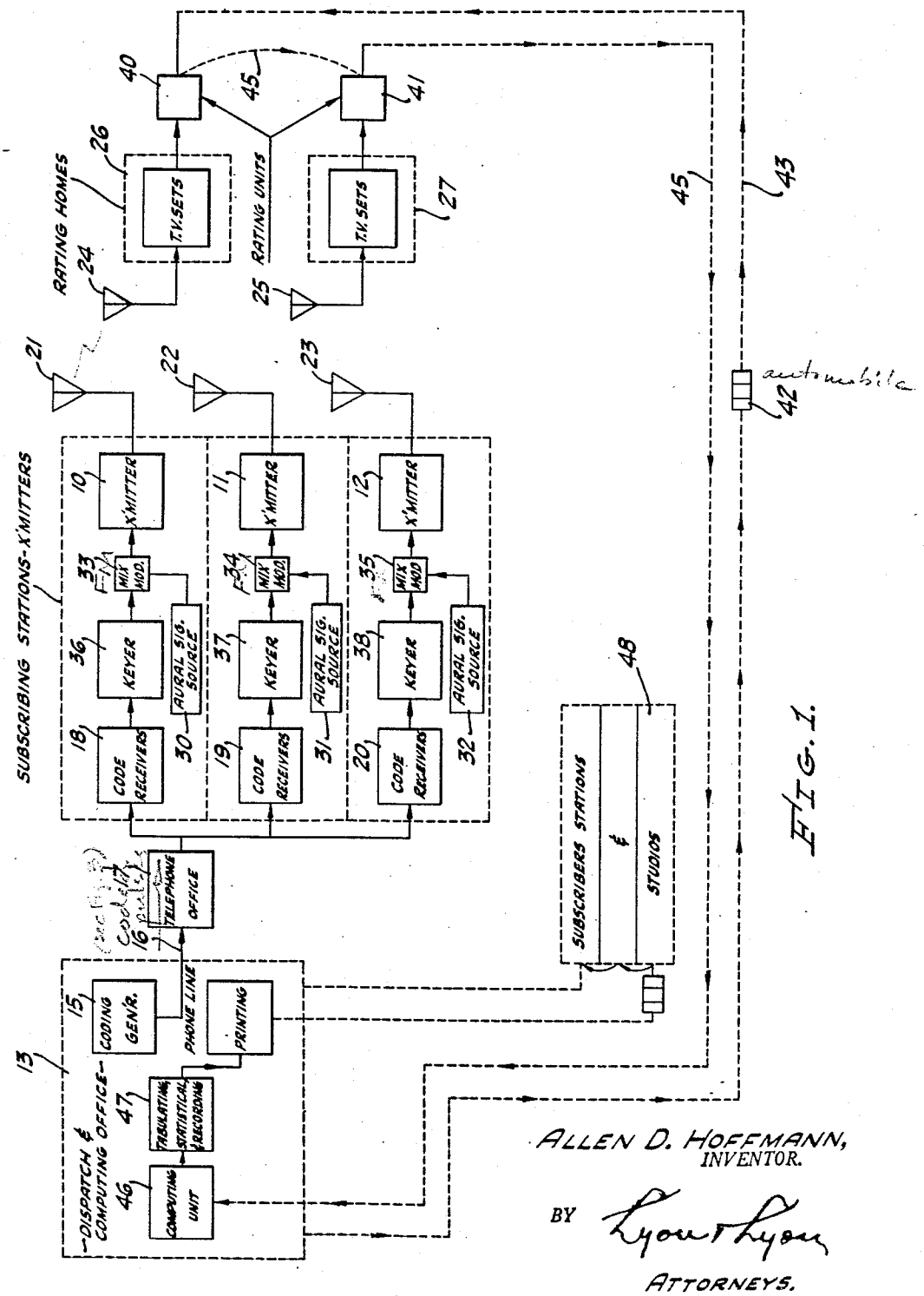


FIG. 1.

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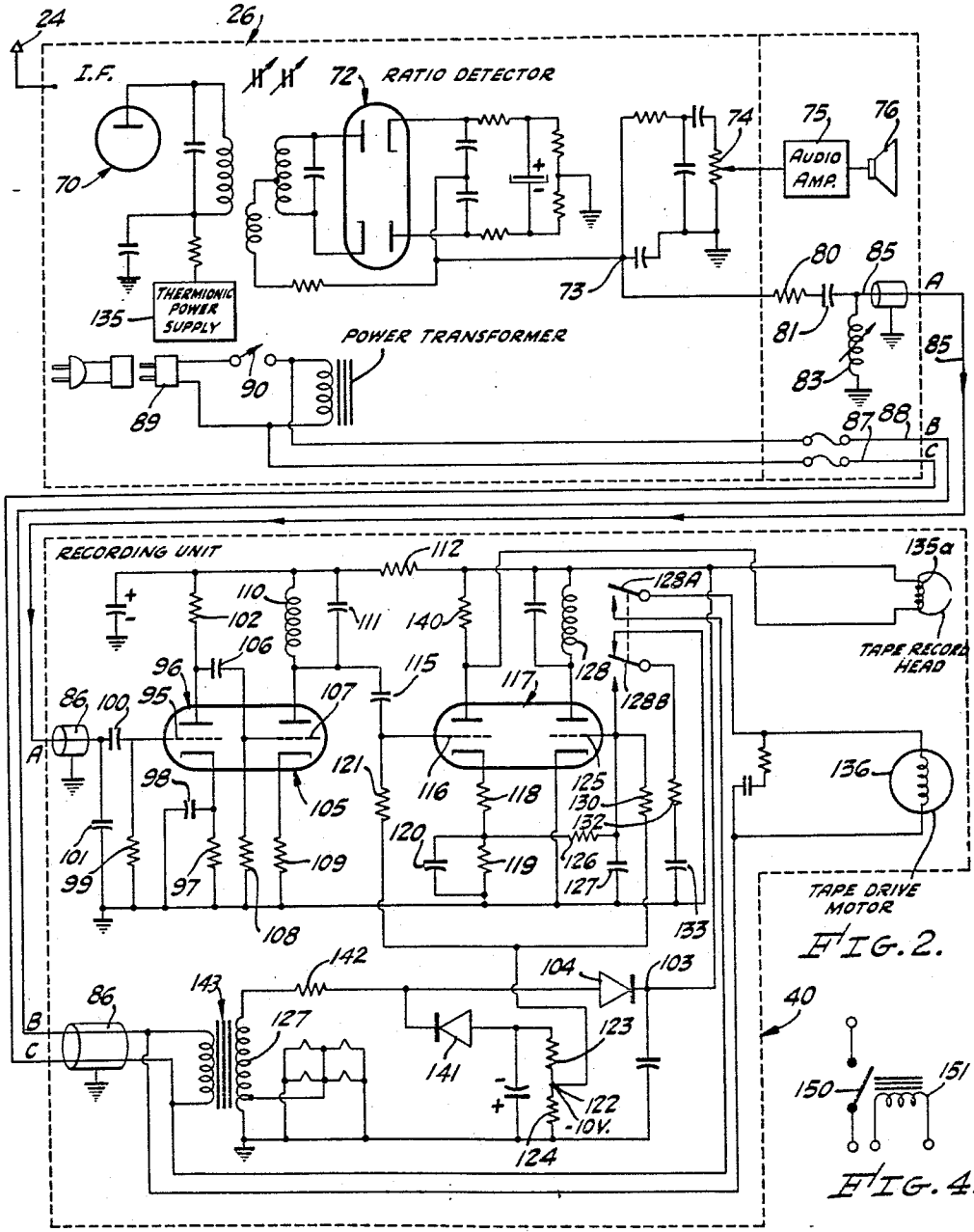


FIG. 2.

FIG. 4.

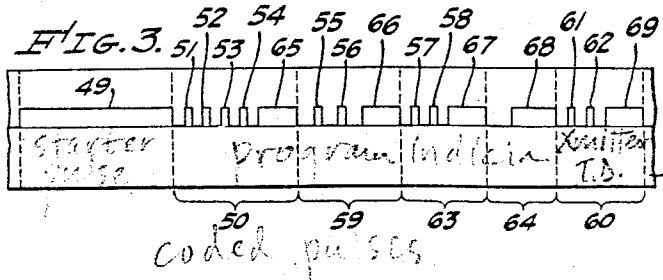


FIG. 3.

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SYSTEM AND APPARATUS FOR DETERMINING POPULARITY RATINGS OF DIFFERENT TRANSMITTED PROGRAMS

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Application July 25, 1951, Serial No. 238,426

4 Claims. (Cl. 250—2)

The present invention relates to an improved means and techniques whereby popularity ratings of different transmitted programs may be determined quickly and relatively inexpensively.

In the transmission of radio and television programs, it is desirable that the station and sponsor of the program be informed as quickly as possible as to the popularity of the transmitted programs. Various means have been heretofore proposed for obtaining this information.

In general, the present invention contemplates the transmission of coded pulses from a transmitting station and the reception and recording of such coded pulses at the receiving station without interfering with the regular transmitted program. Such coded signals may be transmitted at any time during the course of a transmitted program. Since the series of coded signals require a time interval no longer than ten seconds, numerous transmissions may be made at various times, for example, before and after the broadcast of commercials and before and after the transmission of dialog such as telling of jokes, etc., to learn audiences' reaction to the transmisted material.

The present system is instrumental in obtaining such information generally, but certain aspects and concepts of the present invention allows more flexible operation in obtaining more detailed information, as for example, the reaction of the audience to different remarks made during the course of the transmitted program.

An object of the present invention is to provide improved means and techniques whereby the aforementioned results may be obtained quickly, using relatively simple apparatus.

Another object of the present invention is to provide improved apparatus of this character which may readily be connected to different types of receiving systems, the apparatus being relatively small and being easily installed at a location remote from the receiving system, out of sight of the user.

Another object of the present invention therefore is to provide an improved system of the character described in the preceding paragraph characterized specifically in that samples may be obtained using signals which are required to be broadcast for a relatively short period of time in the order of less than ten seconds.

Another specific object of the present invention is to provide an improved system of this character in which the recording element at the receiver is driven for a relatively small period of time, i. e., only during a time commensurate with the transmission time of the coded pulses.

Another object of the present invention is to provide improved means and techniques whereby the necessity for correlating time with recordings is obviated.

Another specific object of the present invention is to provide an improved system of this character wherein the use of time signals and/or correlation of recordings with time is obviated.

Another object of the present invention is to provide

an improved system of this character which minimizes the amount of recording media required.

Another specific object of the present invention is to provide an improved system of this character in which each recording is self-sufficient to identify the station and program without the necessity of extraneous correlation.

Another specific object of the present invention is to provide an improved system of this character in which the recording media is driven intermittently and only when a sampling is desired.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. This invention itself, both as to its organization and manner of operation, together with further objects and advantages thereof, may be best understood by reference to the following description taken in connection with the accompanying drawings in which:

Figure 1 shows in systematic form a system embodying features of the present invention.

Figure 2 is a schematic representation of circuit connections and illustrates the manner in which the apparatus embodying features of the present invention is connected to the audio channel of a user's receiving set.

Figure 3 represents on a linear scale the amplitude and relative durations of the various pulses applied to the code receivers 18, 19 and 20 in Figure 1 as well as the recording obtained at the receiving stations.

Figure 4 serves to illustrate the manner in which certain apparatus in my copending application, Serial No. 225,651, filed May 10, 1951, may be adapted at the transmitting station for remote control of the transmitted code signals.

Referring to Figure 1 each one of a plurality of transmitting stations 10, 11, 12 represented herein as television transmitting stations operating on different channels, is supplied with different coded pulses selectively transferred from a central "dispatch and computing office" 13. The coded signals or pulses are developed in the coding generator 15 and transmitted over the phone line 16 and through the telephone office 17 to corresponding code receivers 18, 19, 20, associated with the transmitters 10, 11, and 12. Transmitters 10, 11 and 12 are shown herein as the transmitters for transmitting the audio component of a television program. In accordance with present Federal Communications Commission Regulations such transmission comprise a frequency modulated wave. Thus the coded signals or pulses received on corresponding receivers 18, 19 and 20 appear as frequency modulated components on the wave transmitted by the corresponding antennas 21, 22 and 23 to the receiving antennas 24 and 25, the antennas 24, 25 being associated with television receiving sets 26, 27 in different localities and used by different individuals. The transmitters 10, 11 and 12 are frequency modulated in accordance with the audio signals developed in corresponding sources 30, 31, 32, which may include conventional microphones or other sound reproducer. Such audio signals represent the audible intelligence which accompanies the transmission of the related television picture. The audio signals developed in the sources 30, 31, 32 are mixed in the mixer modulation stages 33, 34, 35, respectively, with the signals from the keyers 36, 37 and 38. The coded signals are transferred to such stages 33, 34, 35 through keyer stages 36, 37, 38.

The coded signals in the form indicated in Figure 3 appear as supersonic components on the transmitted wave. The means and manner whereby this result is obtained, is more clearly described and shown in my copending application with Robert E. Gottfried and Roy M. Skeirik, Serial No. 225,651, filed May 10, 1951, and assigned to the same assignee. The code generated in the generator 15

is selectively applied to only one of the code receivers 18, 19 and 20, and is in fact preferably a generator comprising a plurality of identical units so that different code signals may be simultaneously transmitted to corresponding code receivers 18, 19, 20 over a plural line system extending from station 13 to each code receiver 18, 19 and 20.

The television stations 10, 11, 12 send out the regular frequency modulated wave which conventionally includes as frequency modulation components thereof the accompanying television sound developed in sources 30, 31 and 32. However, when a sampling is desired, a characteristic coded pulse is transmitted either to code receiver 18, 19 or 20 as the case may be to develop a supersonic wave which is applied through corresponding mixer stages 33, 34, 35, as the case may be, to the transmitters 10, 11, 12, such supersonic wave appearing as a frequency modulation component on the wave transmitted from the corresponding antennas 21, 22, 23.

Assuming that coded information is transmitted from the antennas 21, 22, to the receiving station 26, 27, respectively, which are tuned respectively to the transmissions from transmitters 10 and 11. In such case a recording is made in each of the rating units 40, 41 (described hereinafter), such recordings being subsequently collected and returned by, for example, the automobile 42 traveling in the path indicated by the coded lines 43, 44 and 45 in its travel from the "dispatch and computing office" 13 to the homes in which each of the rating units 40, 41 is located. The recordings are then subjected to the computing unit 46 from which various information and statistics are obtained and recorded in the unit 47; this information is used in correspondence with the television transmitting studios 48 and subscribers' stations.

Of importance in so far as certain aspects of the present invention is concerned is the means and technique developed herein for transmitting information, which is inaudible to a listener, for use in energizing a recorder and producing a recording.

The form of coded pulses applied, for example, to the mixer stage 33, is indicated in Figure 3. Such pulses have the time durations indicated thereon and each pulse is in fact the envelope of a high frequency oscillation, the oscillation in this instance being in the supersonic range of, for example, 15,000 cycles. A typical code signal applied to, for example, the modulation stage 33 comprises a first long pulse 49 constituting such supersonic oscillations lasting for about one second. This first pulse is termed the starter pulse. The series of pulses 50, 59, 63, 64 are used to characterize the number of the transmission. This number in this instance is 4220 since the pulse 50 includes four short pulses 59, 63, 64, 54, the second group of pulses 51 includes two short pulses 55, 56, the third group 52 includes two short pulses 57, 58, and the fourth group 53 contains zero short pulses. The fifth series of pulses 60 contains two short pulses 61, 62, which serve to identify the transmitting station 10 as that of channel 2. The relatively long pulses 65, 66, 67, 68 and 69, in each corresponding group 50, 59, 63, 64 and 60 are termed digit shifting pulses and are used for various purposes in, for example, the computing unit 46 and more specifically to distinguish the short pulses from the long pulses and to separate the different series of pulses.

The frequency modulated wave received on antenna 24 is applied to a conventional television receiving set 26 which may be of the so-called dual I.-F. type as shown herein or may be of the type using one single I.-F. channel, i. e., a so-called intercarrier sound system.

In the dual I.-F. type of receiver 26 shown herein, the wave, after being subjected to superheterodyne action, is applied to the intermediate frequency amplifier tube 70 the output circuit of which is tuned to the mean frequency of the frequency modulated wave. This wave is then applied in a conventional manner to the ratio detector stage 72 to develop the modulation components of sound and supersonic sound frequencies on the lead 73. This lead 73 is coupled through the volume control potentiometer resistance 74 to the audio amplifier stage 75 and speaker 76 so that the user is thus able to hear the accompanying sound of the television transmission.

While the lead 73 also has applied thereto the supersonic oscillation which defines the transmitted code pulses, the audio amplifier 75 and speaker 76 are unable to reproduce the same so that the listener does hear them. This voltage of supersonic frequency however is applied to the rating unit 40 which is coupled through the serially connected resistance 80 and condenser 81 to the lead 73. A tunable coil 83 is connected between ground, i. e., the chassis, and one terminal of condenser 81. The coil 83 is tuned so that maximum voltage of supersonic frequency appears across the same. The ungrounded terminal of coil 83 is connected to lead 85 which forms one of the conductors of a shielded cable having a grounded sheath 86. Two other conductors 87, 88 connected to the power plug 89 through the receiver on-off switch 90 and are disposed within the grounded sheath 86 for purposes of conveying the required energy to the elements in unit 40.

Preferably the rating unit 40 is located at a remote location with respect to the receiver station or out of sight of the user of the receiver. The signals thus developed on lead 73 are thus applied to the control grid 95 of tube 96 through condenser 100. The cathode of tube 96 is returned to ground through the parallel connected resistor 97 and condenser 98. The control grid 95 is returned to ground through resister 99. The input circuit to the tube 96 which includes condenser 101 connected between lead 85 and ground as well as condenser 100 and resistance 99 serves generally as a prefilter to reduce the amplitude of the signals of audible frequency applied to grid 95 but yet serving to apply the signal of supersonic frequency to the control grid of tube 95. In this respect the tuned coil 83 may be considered to be a filter; and the arrangement including the elements 100, 101 and 99 may be considered to be a high pass filter. The anode of tube 96 is connected through resistance 102 to the high voltage terminal 103 of a selenium rectifier circuit which includes the selenium rectifier 104. The anode of tube 96 is coupled to the control grid 107 of tube 105 through coupling condenser 106, such control grid 107 being returned to ground through resistance 108. The cathode of tube 105 is returned to ground through resistance 109.

The anode of tube 105 is connected to the high voltage terminal 103 through the tuned circuit including inductance 110 and condenser 111, as well as serially connected resistance 112, such tuned circuit 110, 111 being tuned to the frequency of the supersonic wave which defines the series of pulses. Normally, in its quiescent state, tube 105 passes a relatively small space current but, upon appearance of the supersonic oscillations, the control grid 107 is driven positive to increase the current flowing therethrough. There is thus developed on the anode of tube 105 a voltage which is applied through condenser 115 to the control grid 116 of dual triode tube 117. Tube 117 has one of its cathodes connected to ground through the serially connected resistances 118, 119, the resistance 119 being shunted by the bypass condenser 120. One of the anodes of tube 117 is connected to the positive terminal 103 through resistance 140. It is observed that the control grid 116 is connected through resistance 121 to the negative terminal 122, such terminal 122 being maintained at a potential of −10 volts. For this purpose, the terminal 122 corresponds to the junction point of serially connected resistances 123 and 124. The resistances 123, 124 are serially connected with the selenium rectifier 141 and resistance 142 to the secondary winding 127 of the power transformer 143. By this means the control grid 116 is normally, in its quiescent state, ren-

dered negative thereby preventing in such condition the flow of space current through one triode of dual triode tube 117 and of course under such condition there is no flow of space current through resistance 140. It is observed that resistance 140 has connected in parallel therewith the recording head 135 of a magnetic tape recorder which includes also the tape driving motor 136. Thus the tape recording head 135 is energizing only when space current flows through the one triode of dual triode tube 117. Such space current is caused to flow when the control grid 116 is driven in the positive direction on appearance of voltages of supersonic frequencies on the anode of tube 107.

The voltage developed across resistance 119 is applied through resistance 126 to the condenser 127, such condenser 127 being connected between the control grid 125 of the other triode of tube 117 and its associated grounded cathode. The other triode of dual triode tube 117 is, in its quiescent state, rendered non-conducting by the connection including resistance 130 between control grid 125 and the negative terminal 122.

The other anode of tube 117 is connected through the relay coil 128 to the positive terminal 103. The other triode of tube 117 is rendered conducting only when a sufficiently high voltage is developed across condenser 127. Since the resistance 126 is serially connected with condenser 127 a certain predetermined time is required for the condenser 127 to become charged. This time is commensurate with the duration of the starter pulse 49 shown in Figure 3. As a matter of fact, the other triode of tube 117 is not rendered conducting until the reception of such starter pulse 49. The voltage developed by the shorter pulses 51, 52, 53, 54 or 65 are insufficient to initiate such conduction. Thus the tube 117 is rendered conducting upon reception of the starter pulse 49 and in such case the winding 128 is energized to cause actuation of its associated switches 128*a* and 128*b*.

Actuation of switch 128*a* results in energization of the tape driving motor 136, it being noted that such motor 136 is serially connected with the switch 128 across the power leads 87 and 88.

Actuation of switch contact 128*b* results in connection of a discharge path of predetermined time constant for condenser 127, such discharge path comprising the serially connected resistance 132 and condenser 133. In the unactuated condition of switch 128*b*, any charge which may have accumulated in condenser 133 is discharged through a path which includes condenser 133, resistance 132 and switch 128*b*. Once condenser 127 has become charged up, the shorter pulses in the coded pulse train serve to maintain that charge until the pulse train is terminated and the discharge path for the condenser has reduced its charge sufficiently low to insure cessation of current flow through the associated triode section of tube 117. Thus the recorder is maintained operative during the pulse train and for a short time thereafter to insure a complete recording.

It is understood, that most television and radio receivers have electronic power supplies 135, which include thermionic rectifier tubes for supplying space current to tubes such as the I.-F. amplifier stage 70. Such thermionic power supplies require some initial period for heating.

In order to avoid time lags in the recording unit and thus the possibility of spurious results, selenium rectifiers 104, 141 are used in the recording unit 40. Such selenium rectifiers 104, 141 are practically instantaneous in their operation and thus when the user first switches on his receiver, by actuating the switch 90, he is assured that his recording unit 40 is in operation prior to his receiver. Thus, in operation of the system, at the times at which sampling is desired, a group of code signals of the character illustrated in Figure 3 is transmitted from the transmitting station, for example, over the antenna 21 in Figure 1 simultaneously with the transmitted program. The code signals of course are transmitted as frequency modulation components of the transmitted wave. After reception and detection at the receiving station, the series of code signals applied to the rating unit serves to first initiate operation of the tape drive motor so as to effect movement of a recording medium. Such initiation of the drive motor 136 is accomplished by the relatively long starter pulse 49. While the recording medium is thus driven, the series of pulses in groups 50, 59, 63, 64 and 60 are applied to the recording head 135 to produce a recording as illustrated in Figure 3.

Figure 3 serves to illustrate both the character of the recording made on the recording medium 180 which is driven by the tape drive motor 136 and serves also to illustrate the character of the pulses applied as modulation components to the transmitted wave.

The total transmission time of the code signals beginning with the starter pulse 49 and ending with the pulse 69 may be in the range of 2.5 to 7 seconds depending upon the particular program number. Each unit pulse 51, 52, 53, 54, 55, 56, 57, 58, 61 and 62 may each be approximately 50 milliseconds, which is comparable to three complete cycles of a 60-cycle wave. The spacing between such unit pulses may be in the order of 67 milliseconds. The duration of the digit pulses 65, 66, 67, 68 and 69 may be in the order of 200 microseconds and the clearing or starting pulses 49 may have a duration of 1200 microseconds.

For a more detailed description of the keyer 36, 37, 38 in the different transmitting stations shown in Figure 1, recourse is had to my abovementioned copending application, Serial No. 225,651 and to Figure 4 herein. Figure 4 shows a relay actuating switch 150 which, for all intents and purposes, is the switch 13H shown in Figure 1 of such copending application, the switch 150 herein being connected in the precise manner as switch 13H to the other apparatus in my copending application. In this instance, the switch 150 is operated upon application of pulses to the relay winding 151. The duration of such pulses applied to winding 151 corresponds with the duration of the different pulses illustrated in Figure 3. Such pulses are transmitted from the dispatch and computing office 13 over the phone line 16 and telephone office 17 to the code receiver 18, such code receiver 18 including the switch 150.

While the present invention is described in specific relationship to a television system and more particularly to the transmission of code signals over a frequency modulation system, it is understood and appreciated that the present invention may likewise be used in present day amplitude modulation radio systems in the standard broadcast band. In such latter case, code signals comprise envelopes of a much lower frequency of, for example, 7 kilocycles. Such signals of 7 kilocycles appear in such case as an amplitude modulation component of the transmitted wave and suitable means, well understood to those familiar in the art, may be used at the receiver coupled to the detector stage for separating such code signals at the receiver for initiating operation of the recording and producing a recording representative of the transmitted code signals, all as taught and described hereinabove.

In connection with the operation of the relay switch contacts 128*b*, it is observed, that in its quiescent state the condenser 133 is discharged and both of its terminals are at ground potential. At the time the switch contacts 128*b* are actuated, the control grid 125 is substantially at ground potential so that when the condenser 133 is connected to such control grid there are only minor transits which are not bothersome. Usually the switch coil 128 is actuated approximately after one half the duration of the starter pulse 49. After the switch coil 128 is actuated the condensers 127 and 133 are in parallel and are allowed to discharge through a circuit including the shunt connected resistance 130 on the one

hand and resistances **132** and **119** on the other hand. The condenser **127** may have a value of .25 microfarad; the condenser **133** may have a value of 2 microfarads; the resistor **132** may be 47,000 ohms; resistance **130** may be 1 megohm; the resistance **126** has a value of 680,000 ohms; and resistance **119** may have a value of 15,000 ohms. The resistances **123** and **124** may have values of 39,000 and 3,300 ohms, respectively.

In comparison to the system shown in my above-mentioned copending application Serial No. 225,651, it is observed, that the present system is relatively simple in obtaining the information desired in this particular instance. Whereas the system described in the aforementioned copending application uses three different supersonic frequencies with one of such frequencies used to condition the recording apparatus for operation, the present system depends for its operation on the presence of the relatively long starting pulse. Another distinction is that the present system uses an integrating circuit which comprises the condenser **127** operating in conjunction with the long starter pulse.

I claim:

1. In a system of the character described, the combination of: a transmitting station for transmitting to a receiving station a program; means at the transmitting station for transmitting to said receiving station, concurrently with said program, a series of code signals comprising a relatively long starter pulse and a plurality of series of pulses serving to identify the program and the station transmitting said code signals; a magnetic tape recording system at said receiver station inoperative during standby intervals, said magnetic tape recording system including a motor and a tape recording head, an integrating network sensitive to the duration of said starter pulse, means operatively coupling said integrating network to said motor for initiating operation of said magnetic tape recording system to produce a recording representative of said plurality of series of code signals responsive to application to said integrating network of a starter pulse.

2. A system as recited in claim 1 wherein said means operatively coupling said network to said motor includes an electron tube having an anode, cathode and control grid electrode, said integrating network being coupled to said control grid, a relay having a coil and two sets of contacts, a source of energy for said recording system motor, and a discharge network, said relay coil being connected in series with said tube anode, one of said sets of contacts being connected between said source of energy and said recording system motor and said other set of contacts being connected between said discharge network and said control grid.

3. A receiver for receiving program signals and concurrently therewith a series of code signals including a relatively long starter pulse and a plurality of series of pulses serving to identify said program, said receiver having a magnetic tape recording system inoperative during standby intervals, said magnetic tape recording system including a motor and a tape recording head, an integrating network senstive to the duration of said starter pulse, means operatively coupling said integrating network to said motor for initiating operation of said magnetic tape recording system to produce a recording representative of said plurality of series of code signals responsive to the application of a starter pulse to said integrating network.

4. A receiver as recited in claim 3 wherein said means operatively coupling said network to said motor includes an electron tube having an anode, cathode and control grid electrode, said integrating network being coupled to said control grid, a relay having a coil and two sets of contacts, a source of energy for said recording system motor, and a discharge network, said relay coil being connected in series with said tube anode, one of said sets of contacts being connected between said source of energy and said recording system motor and said other set of contacts being connected between said discharge network and said control grid.

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