

- [54] AUTOMATIC HOMING SYSTEM FOR A SUBSCRIPTION TELEVISION SIGNAL DECODER
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- [52] U.S. Cl. **358/122; 358/114; 358/117; 358/193.1; 455/185**
- [58] Field of Search **358/114, 117, 193.1, 358/122; 455/185**

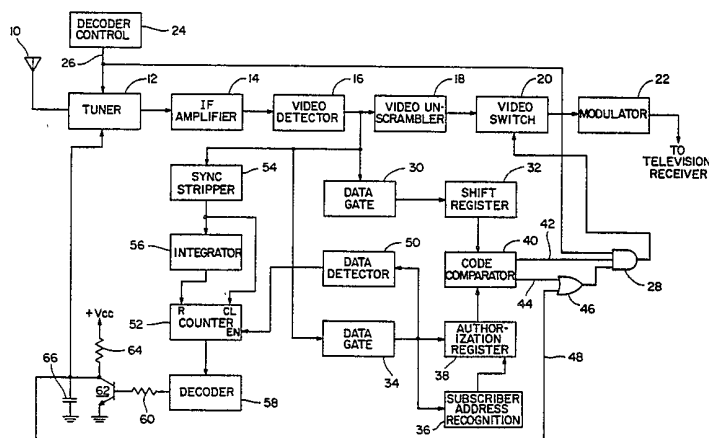
- [56] **References Cited**
- U.S. PATENT DOCUMENTS**
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|-----------|--------|--------------------|---------|
| 4,079,419 | 3/1978 | Siegle et al. | 358/117 |
| 4,222,068 | 9/1980 | Thompson | 358/124 |
| 4,225,884 | 9/1980 | Block et al. | 358/122 |
| 4,323,922 | 4/1982 | Toonder | 358/117 |
| 4,430,669 | 2/1984 | Cheung | 358/117 |

Primary Examiner—S. C. Buczinski

[57] **ABSTRACT**

An automatic homing system for a subscription television signal decoder comprises a tuning system responsive to a decoder off-command signal for operation in a search mode wherein successive television channels are sequentially tuned until a subscription television signal is detected. As a result, the memory circuits of the decoder may be refreshed with updated subscriber authorization data in response to a transmitted subscription television signal even though the decoder is turned off.

10 Claims, 2 Drawing Figures



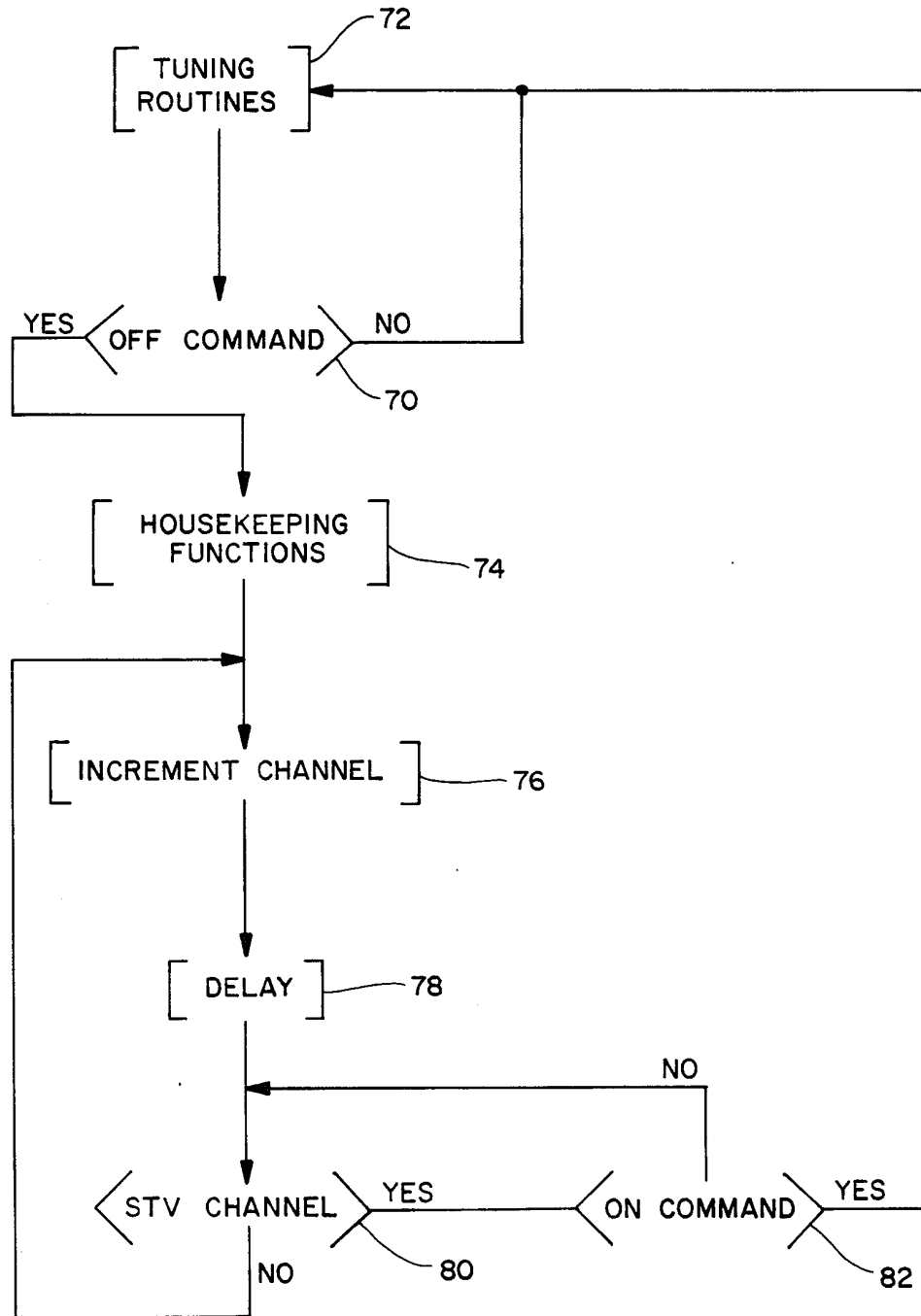


Fig. 2

AUTOMATIC HOMING SYSTEM FOR A SUBSCRIPTION TELEVISION SIGNAL DECODER

BACKGROUND OF THE INVENTION

The present invention relates generally to subscription television signal decoders and, more particularly, to an improved homing system for automatically tuning a subscription television signal decoder which has been placed in an "off-mode" by a subscriber to a subscription television channel for receiving current subscriber authorization data.

In subscription television systems, television signals are typically transmitted to system subscribers in a scrambled form either along a coaxial cable or as an "over-the-air" broadcast. Each subscriber is provided with a decoder operable for unscrambling the subscription television signals, which unscrambled signals are supplied to a conventional television receiver for viewing. Quite often, the decoders are of the multi-channel variety wherein subscription television signals transmitted over a plurality of television channels may be selectively tuned by a conventional subscriber operated tuning system before being applied to the unscrambling circuits. In such cases, the subscription television signals are frequently grouped into a number of levels or tiers each representing a different programming category such as sporting events, movies, etc., with the decoder of a particular subscriber being authorized for decoding or unscrambling the televised subscription programming signals in selected categories, the televised subscription programming signals in the remaining unauthorized categories being coupled on the television receiver in a scrambled and unviewable form. Of course, in such a system, all of the subscription television signals will be reproduced in a scrambled and unviewable form by a normal television receiver.

In a tiered subscription television system as described above, each system subscriber may selectively subscribe to one or more of the programming tiers as his or her interests dictate. To this end, each decoder, which is uniquely identified by a stored subscriber address code, includes a subscriber authorization register storing a subscriber authorization code identifying the program tiers which the subscriber is authorized to decode. The stored subscriber authorization code is compared to a program code typically transmitted during a selected horizontal line of the vertical intervals of a tuned subscription television signal, the program code identifying the programming level or tier of the accompanying television signal. If the stored subscriber authorization code and the broadcast program code result in a favorable comparison, suitable decode authorization signals are developed in the decoder enabling the received television signal to be decoded and coupled to the subscriber television receiver for viewing. On the other hand, if a proper match between the subscriber authorization code and the transmitted program code is not detected, indicating that the subscriber is not authorized to decode television signals in the programming tier identified by the broadcast program code, the decode authorization signals are not developed and the received television signal is not unscrambled by the decoder.

From time to time, it is necessary to update or refresh the stored subscriber authorization codes to reflect changes in the programming status of the subscribers, to completely de-authorize delinquent subscribers or, for

example, to selectively authorize the decoding of special event or premium programs. Such updating or refreshing operations are typically accomplished by sequentially addressing the system decoders for entering the updated subscriber authorization codes during one or more horizontal lines of the vertical intervals of the broadcast subscription television signals. Since a relatively long period of time may be required to address all of the decoders in the system, it has been found convenient to at least partially execute the memory refreshing operation at night while the decoders are turned off. To facilitate such, much of the circuitry of the decoders, including the tuning system thereof, is maintained in an operational status even though the decoder is ostensibly turned off by the subscriber. In addition, steps must be taken to insure that, upon being turned off by a subscriber, the decoder tuner reverts or homes to a television channel through which subscription television signals are being transmitted and not to a channel used for transmitting normal un-encoded television signals. In the past, decoders have been designed such that their tuning systems would automatically home to a selected one of a limited number, e.g. four, of pre-programmed homing channels. Therefore, by selecting a pre-programmed homing channel which is also a subscription channel, the operator of the subscription system can insure that the tuning system of the decoder will home to a television channel enabling the decoders to be suitably refreshed when placed in an off-mode by the subscriber.

While such limited pre-programmed homing channel systems generally provide adequate flexibility, they are subject to a number of major disadvantages. Initially, there is the time and expense of selecting and pre-programming each decoder supplied to a system subscriber. Also, and perhaps more importantly, it is quite possible that the system operator might not be using any of the pre-programmed homing channels as a subscription channel in which case the tuning systems of each decoder must be custom programmed for the particular application. This leads to additional costs and represents a highly undesirable situation.

It is therefore a basic object of the present invention to provide an improved homing system for a subscription television signal decoder.

It is a more specific object of the invention to provide a homing system for a subscription television signal decoder which automatically homes or reverts to a subscription television channel when the decoder is placed in an off-mode of operation.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects and the advantages thereof, may best be understood by reference to the following description taken in conjunction with the accompanying drawing in which:

FIG. 1 is a block diagram showing a subscription television signal decoder incorporating an automatic homing system according to the present invention; and

FIG. 2 is a flow chart illustrating the method of operating the tuning system of the decoder of FIG. 1 in the automatic homing mode.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, there is illustrated a subscription television signal decoder operable for unscrambling a broadcast RF television signal. The scrambled subscription television signal may, for example, be derived as taught in U.S. Pat. No. 4,222,068 to Thompson by modifying a standard NTSC television signal by suppressing the amplitude of randomly selected horizontal blanking and synchronization pulses during the fields of the video signal. As a result, the horizontal deflection system of a normal television receiver will lock on random video peaks during the active or video trace line portions of the video signal rather than on the actual horizontal synchronization pulses resulting in the production of a scrambled video image on the viewing screen of the television receiver. In addition, the ability of the television receiver to use the color reference burst associated with the horizontal synchronization signals is severely degraded causing inaccurate color reproduction. In addition, a program code identifying the programming tier of the accompanying television signal is encoded in a horizontal line of each vertical interval of the television signal. Also, one or more vertical interval horizontal lines of the subscription television signal are normally used for transmitting the subscriber address and authorization codes. The latter codes are transmitted on a serial basis so that the decoder of each subscriber may be individually addressed and refreshed with an updated subscriber authorization code from time to time.

In one known subscription television system, for example, a five bit program code identifying the programming tier of the accompanying subscription television signal is transmitted during horizontal line 13 of each vertical interval while horizontal lines 10, 11 and 12 are each used to transmit a twenty bit subscriber address code together with a five bit subscriber authorization code. In this manner, the decoders may be addressed one at a time for updating the stored subscriber authorization codes which are compared with the transmitted program code on horizontal line 13 to determine whether a particular subscriber is authorized to decode the received subscription television signal.

With further reference to FIG. 1, the illustrated decoder comprises an antenna 10 adapted for intercepting broadcast RF television signals which may comprise either scrambled subscription television signals as described above or normal unscrambled television signals. The intercepted broadcast television signals are coupled from antenna 10 to a conventional television signal tuning system 12 which, as well known in the art, converts the received RF television signals to a suitable intermediate frequency signal. The intermediate frequency signal developed at the output of tuning system 12 is conventionally applied through an intermediate frequency amplifier 14 to the input of a video detector 16 whose output therefore comprises a baseband representation of the received television signal.

The composite baseband video signal developed at the output of video detector 16 is applied to the input of a video unscrambler 18 and therefrom through a video switch 20 to the input of a modulator 22. Video unscrambler 18 is adapted for unscrambling the baseband subscription television signal such as, for example, by restoring horizontal sync thereto. As will be explained in further detail hereinafter, video switch 20 is used to

selectively gate the unscrambled subscription television signal to remodulator 22 depending upon whether the subscriber is authorized to decode the signal. Modulator 22 modulates the decoded baseband signal onto a standard television channel carrier and couples the modulated television signal to the antenna terminals of a conventional television receiver for viewing.

Subscriber operation of the decoder is facilitated by a decoder control unit 24. Decoder control 24, which may comprise either a remote controlled hand held device or a control unit integral with the decoder, provides means for controlling such functions as channel selection, ON/OFF mode selection, etc. Of particular significance in relation to the present invention is the ON/OFF mode selection signal developed on an output conductor 26 of decoder control 24. The ON/OFF mode selection signal, which is coupled to an input of tuning system 12 and also to 1 input of AND gate 28, assumes a logical 1 state when the decoder is turned on by the subscriber and assumes a logical 0 state when the decoder is turned off by the subscriber. When the decoder is turned on causing the ON/OFF mode selection signal to assume a logical 1 state, the decoder is operable for tuning and decoding a subscription television signal broadcast over a selected television channel and for coupling the decoded signal to a television receiver via modulator 22. As will be explained in further detail below, the decoder is also operable for tuning a nonsubscription television signal transmitted over a selected television channel for coupling to the television receiver via modulator 22. On the other hand, when the decoder is turned off causing the ON/OFF mode selection signal to assume a logical 0 state, video switch 20 is disabled whereby a blanked video signal is coupled to the input of modulator 22.

The composite baseband signal developed at the output of video detector 16 is also coupled to the input of a first data gate 30 which is adapted for gating the current program code developed on each horizontal line 13 of the subscription television signal to a shift register 32. The composite baseband video signal is also coupled to the input of a second data gate 34 which is adapted for gating the subscriber address codes transmitted on horizontal lines 10, 11 and 12 to the input of a subscriber address recognition circuit 36 and the accompanying subscriber authorization codes to the input of a subscriber authorization register 38. If a transmitted subscriber address code corresponds to the stored subscriber address code identifying a particular subscriber, an output is developed by recognition circuit 36 causing subscriber authorization register 38 to load the associated transmitted subscriber authorization code. By the foregoing means, it will be recognized that the subscriber's stored authorization code may be updated from time to time by the subscription television signal to reflect changes in his or her authorization status.

The current program code stored in shift register 32 and the subscriber authorization code stored in register 38 are coupled to the inputs of a code comparator 40. Code comparator 40 includes a first output 42 which is coupled to a second input of AND gate 28 and a second output 44 which is coupled to one input of an OR gate 46, the output of OR gate 46 being coupled to the third and final input of AND gate 28. A second input to OR gate 46 is derived from a conductor 48. Output 42 of code comparator 40 assumes a logical 0 state if the subscriber authorization code stored in register 38 corresponds to a value representing that the subscriber is

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