

[54] **COMMUNICATION INCLUDING SUBMERGED IDENTIFICATION SIGNAL**

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[21] Appl. No.: **162,774**

**Related U.S. Application Data**

[63] Continuation-in-part of Ser. No. 848,381, July 8, 1969, abandoned, which is a continuation-in-part of Ser. No. 530,563, Feb. 28, 1966.

[52] U.S. Cl. .... **325/64, 343/225**

[51] Int. Cl. .... **H04h 9/00**

[58] **Field of Search** ..... 179/2, 2 TC, 3, 100.2 R; 325/31, 51, 52, 64, 55, 66, 392, 396, 311, 37; 178/5.6; 343/225-228

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**UNITED STATES PATENTS**

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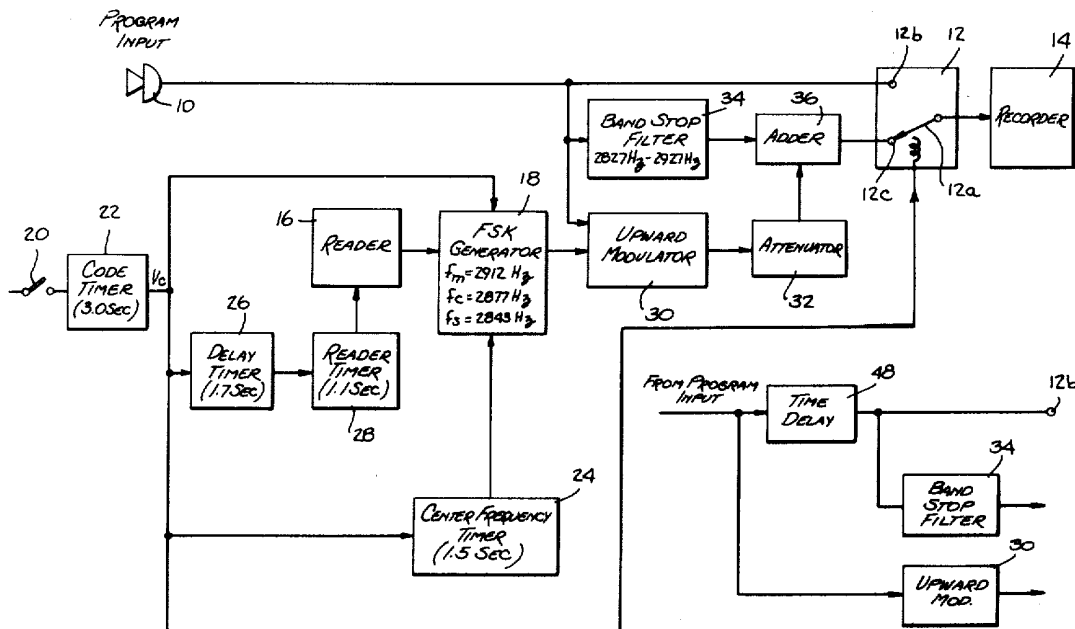
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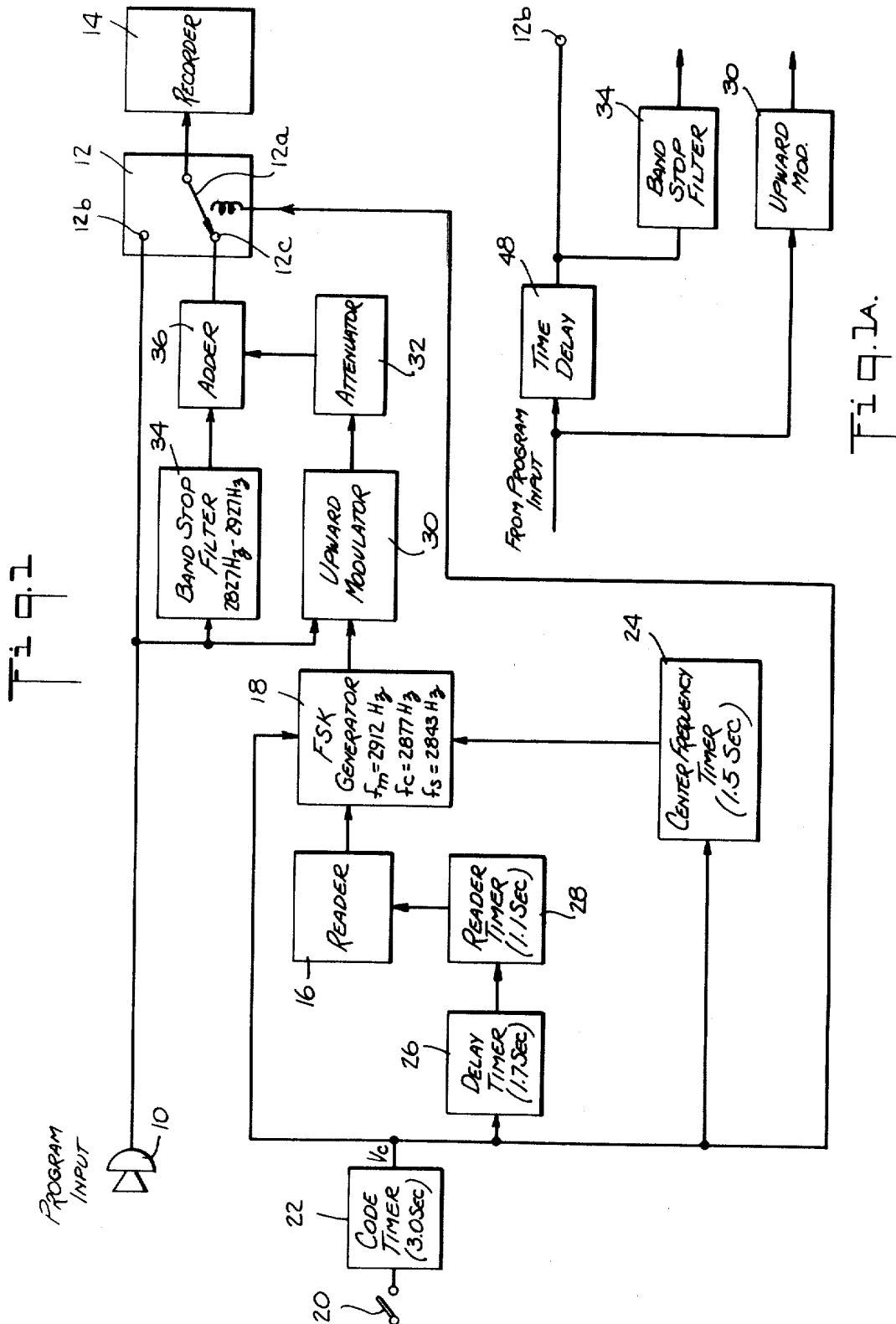
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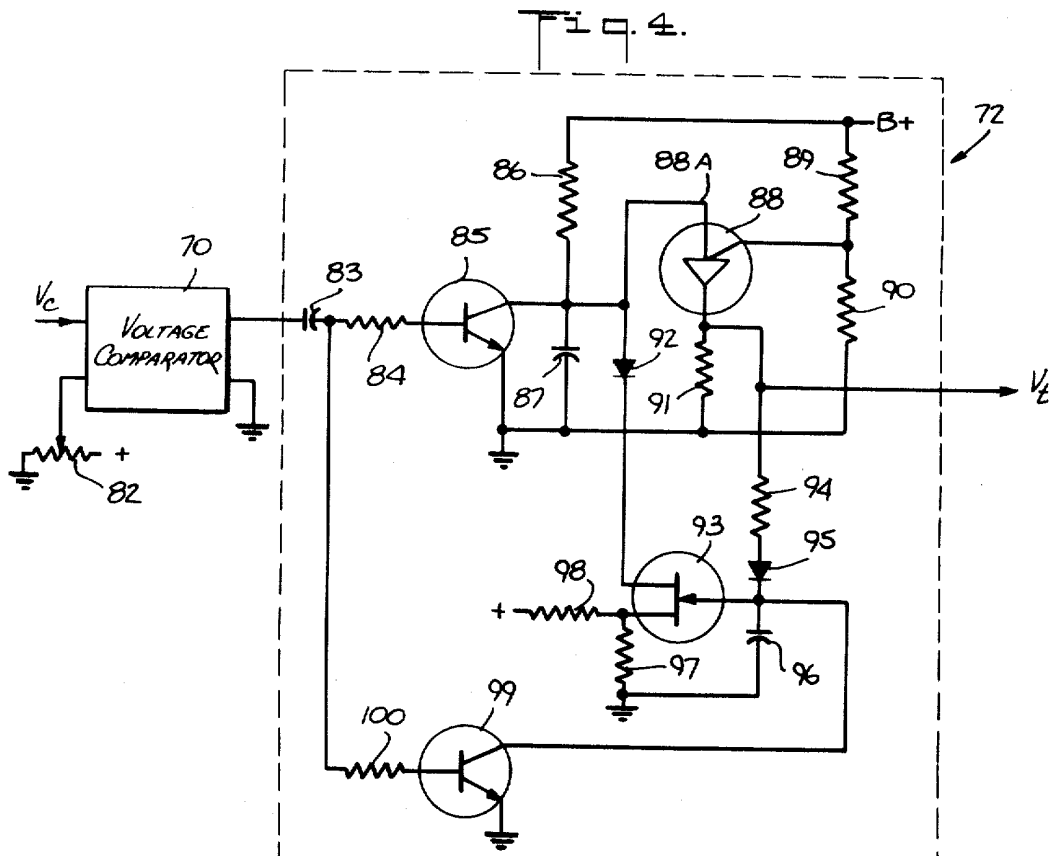
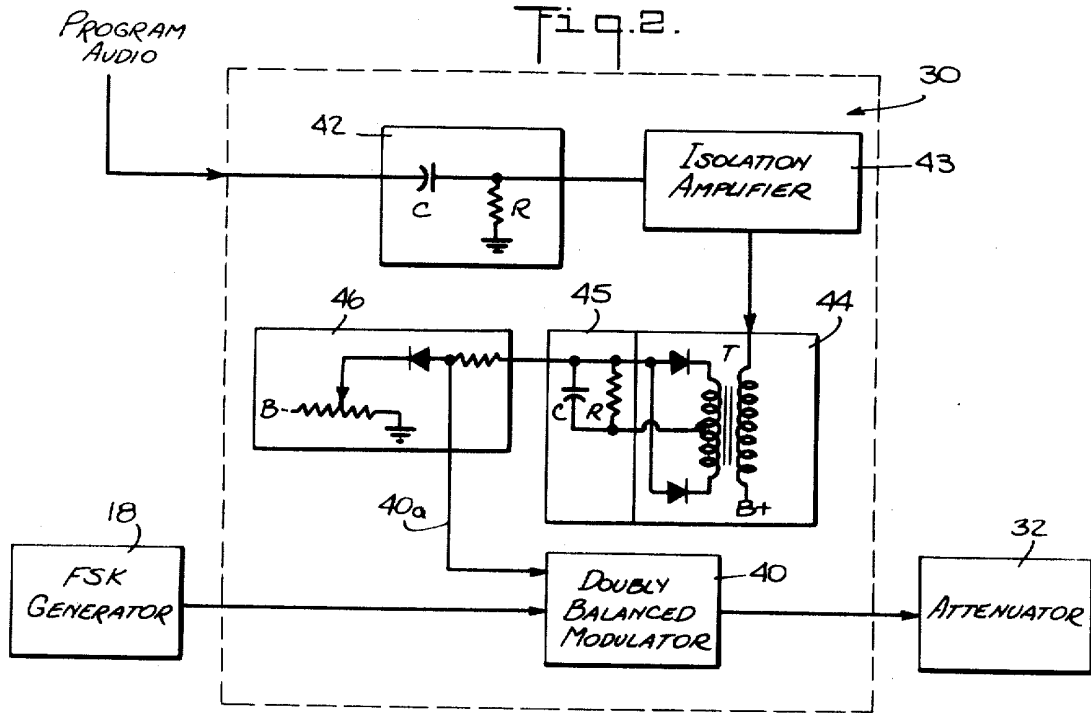
[57] **ABSTRACT**

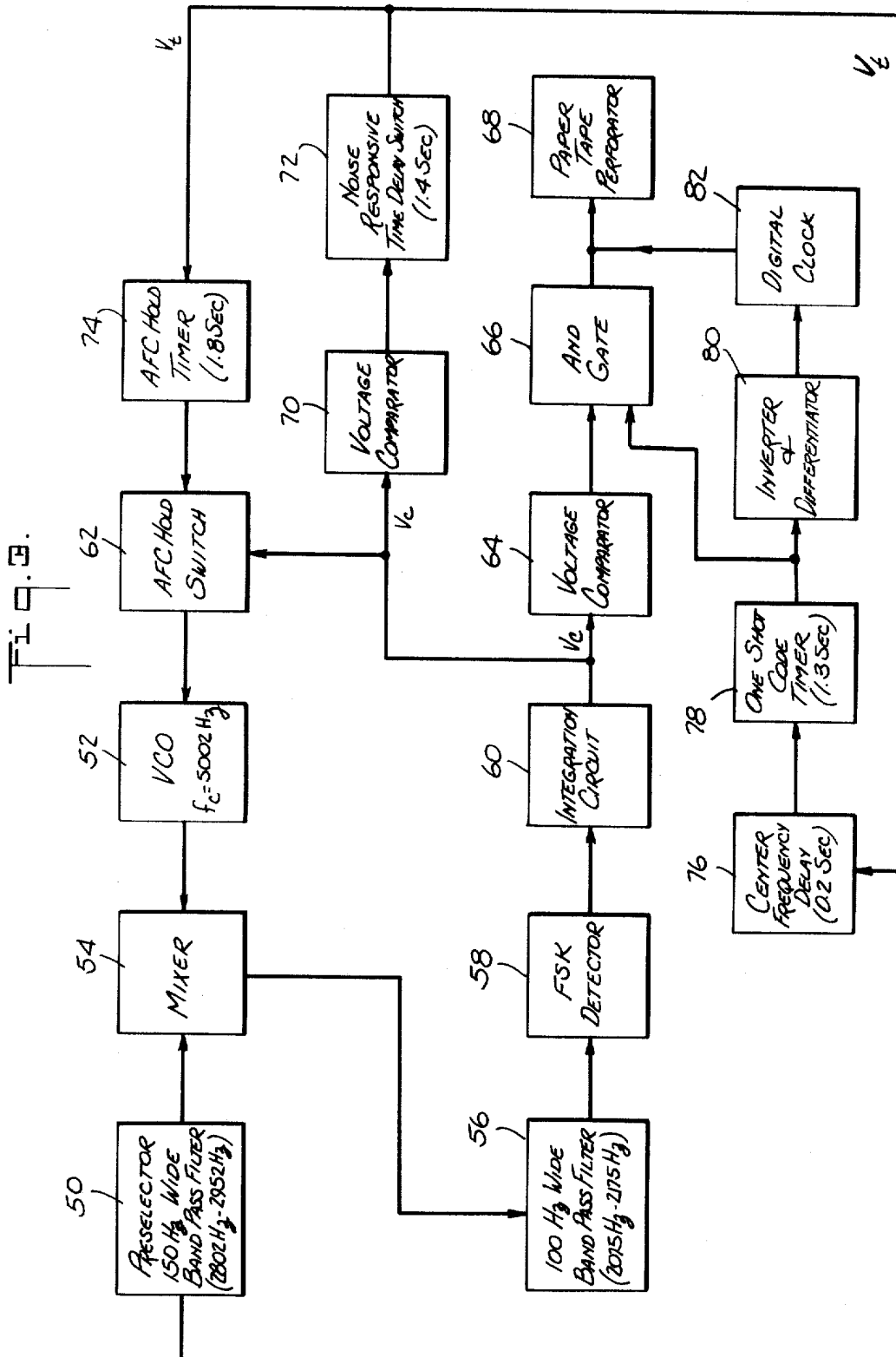
A technique for identifying a program with an identification code in which the code is modulated onto an audio frequency subcarrier and transmitted with the program. A short time period, narrow band width window is cut out of the program material to accommodate the code carrying modulated audio subcarrier. The amount by which the code modulates the subcarrier is made to track with the audio envelope of the program and thus minimizes the listener's ability to hear the code. The receiver equipment automatically responds to the presence of the subcarrier and detects the code. Unmodulated subcarrier is transmitted immediately prior to the code modulation to assure that there is no ambiguity between the code signal and program material. Automatic frequency control responsive to the unmodulated subcarrier compensates for tape or disc recorder speed variation. The automatic frequency control is disabled during the actual code transmission to prevent a receiver response that might wipe out the code signal.

**17 Claims, 5 Drawing Figures**









## COMMUNICATION INCLUDING SUBMERGED IDENTIFICATION SIGNAL

### CROSS REFERENCE TO RELATED APPLICATIONS

This is a continuation-in-part of a patent application Ser. No. 848,381 filed July 8, 1969, now abandoned, which in turn was a continuation-in-part of now abandoned patent application Ser. No. 530,563 filed Feb. 28, 1966. Both of these patent applications were entitled: Communication Including Submerged Identification Signal.

### BACKGROUND OF THE INVENTION

This invention relates in general to a communication system and more particularly to a technique for providing a unique identification code for any broadcast program material, and in particular for advertising, so that an appropriate receiver can detect the code and identify that the program has been sent.

There are a number of systems that have been developed and proposed for transmitting auxiliary information along with the main program being broadcast. Super-audible and sub-audible subcarrier transmission has been used in the prior art for achieving such multiplexing of an allocated broadcast channel. Some idea of the scope of techniques employed can be obtained from a review of U.S. Pat. Nos. 2,766,374; 3,061,783 and 3,391,340. These known techniques are not particularly well adapted to the transmission of unobtrusive coding signals for identifying and verifying the transmission of particular programs.

In general, the known and proposed techniques employ an unacceptably large portion of the program channel. In particular, there is too much interference with the program material.

Accordingly, it is a major purpose of this invention to provide a coding technique for identifying a program, wherein the coding technique occupies a minimum amount of program space.

In particular, it is an important purpose of this invention to provide a program identification technique that is unnoticed by the listener.

One current technique for monitoring advertisements on television is to hire individuals around the country who look at television and make a record of the time, nature and duration of various advertisements. This technique is expensive, subject to some degree of error and cost considerations greatly limit its use.

Accordingly, it is another important purpose of this invention to provide an identification technique for program material that is automatic on the receiving end and does not require a human monitor.

The cost of human monitoring is sufficiently great so that it can be used only in connection with television and not in connection with radio, and even at that, only on a sampling basis.

Accordingly, it is another purpose of this invention to provide an automatic program monitoring technique that can be employed in both television and radio broadcasting.

### BRIEF DESCRIPTION OF THE INVENTION

This invention is a technique for identifying and verifying the transmission of and duration of recorded radio and television program material including adver-

tising and recorded music. A binary identification code is modulated onto an audio frequency subcarrier to provide a narrow band modulated subcarrier requiring a channel of one hundred Hertz (Hz) in width.

The audio subcarrier is transmitted for about three seconds at the beginning, and for about three seconds at the end of the program material being identified. The audio subcarrier is frequency shift modulated with the binary code signal for the latter part of that three second time period. During the three second period when the audio subcarrier is added to the program material, a band stop filter is switched in to filter out the program material over the one hundred Hz subcarrier channel width. The band stop filter is switched out at the end of the three second time period. Thus a three second long, one hundred Hz wide window is provided in the program material to accommodate the code.

The magnitude of the audio subcarrier signal (whether or not modulated by the code) is made to track with the audio level of the program so that the amplitude of the audio subcarrier (that is, the modulated audio subcarrier) can be as low as possible to provide accurate code detection at the receiver while remaining unnoticed by the listener.

In one embodiment, when program audio level is nil, the subcarrier is fifty-five decibels (db) down from the audio level that provide 100 percent carrier modulation. When program audio is at a level that will modulate the carrier 100 percent, then the audio subcarrier is forty db down from that program audio level.

A band pass filter in the receiver passes only the modulated subcarrier, which subcarrier is then demodulated to provide the binary identification code for the program involved.

The audio frequency subcarrier is run unmodulated for 1.5 seconds prior to being modulated by the 1.1 second duration binary identification code. The relatively long (1.5 second in duration) continuous tone, which is the unmodulated subcarrier, provides a condition that enables the code receiver to distinguish between the immediately following code modulated audio subcarrier and other audio signals that might be present, particularly when music is played.

An automatic frequency control (AFC) system at the receiver overcomes the de-tuning of the audio frequency subcarrier that occurs due to such factors as variations in tape or disc recorder speed. The AFC locks onto the audio subcarrier during the 1.5 second period of unmodulated subcarrier transmission prior to code transmission. The binary code is modulated onto the subcarrier by a frequency shift key (FSK) generator. Thus for the condition of "mark" the subcarrier is up thirty-five Hz from the center frequency and for the condition of "space" the subcarrier is down thirty-five Hz from center frequency. To avoid having the AFC wipe out the identification code which is modulated onto the audio subcarrier by a frequency shift modulation, the AFC is frozen to a fixed tuning immediately prior to the appearance of the modulation (the identification code) on the subcarrier.

### BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a block diagram of that portion of the system of this invention which adds the identifying code to the program material so that combined code and program can be placed on a record.

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