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(71) Applicants
Fouad Victor El-Khazen
Mondesfield, Exeter Road, London, NW2 4SL, United Kingdom

Danny Wadih Tomeh
Mondesfield, Exeter Road, London, NW2 4SL, United Kingdom

(72) Inventors
Fouad Victor El-Khazen
Danny Wadih Tomeh

(74) Agent and/or Address for Service
Edward Evans & Co
Chancery House, 53-64 Chancery Lane, London, WC2A 1SD, United Kingdom

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G10K 15/02

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G5J JEBA J5S
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(56) Documents cited
GB 2252657 A GB 2219873 A GB 2056152 A
WO 90/13109 A DE 003420463 A

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INT CL[5] A63H, B60Q, G10K

(54) Audio frequency signal generating apparatus

(57) Audio frequency signal generating apparatus comprises a transducer 13, 23, 33, 43 responsive to a parameter of the drive system of a vehicle for producing a control signal in response to said parameter, and an audio frequency signal generator 11 whose frequency and/or amplitude is variable in response to said control signal. The audio frequency signal may constitute or may be used to generate a noise appropriate to the parameter of the drive system and may be of an enhanced character so that the user hears a noise simulating a different vehicle from the one with which he is travelling.

The transducer may be rf, magnetic, mechanical or opto-electronic and responsive to eg. the ignition of an ic engine, the mechanical drive from an engine or the chain drive of a bicycle. The audio frequency signal may be transmitted to the in car radio receiver, direct to the amplifier, as a magnetic signal to tape pick-up heads, or as an electromagnetic signal to a compact disc reproduction head.

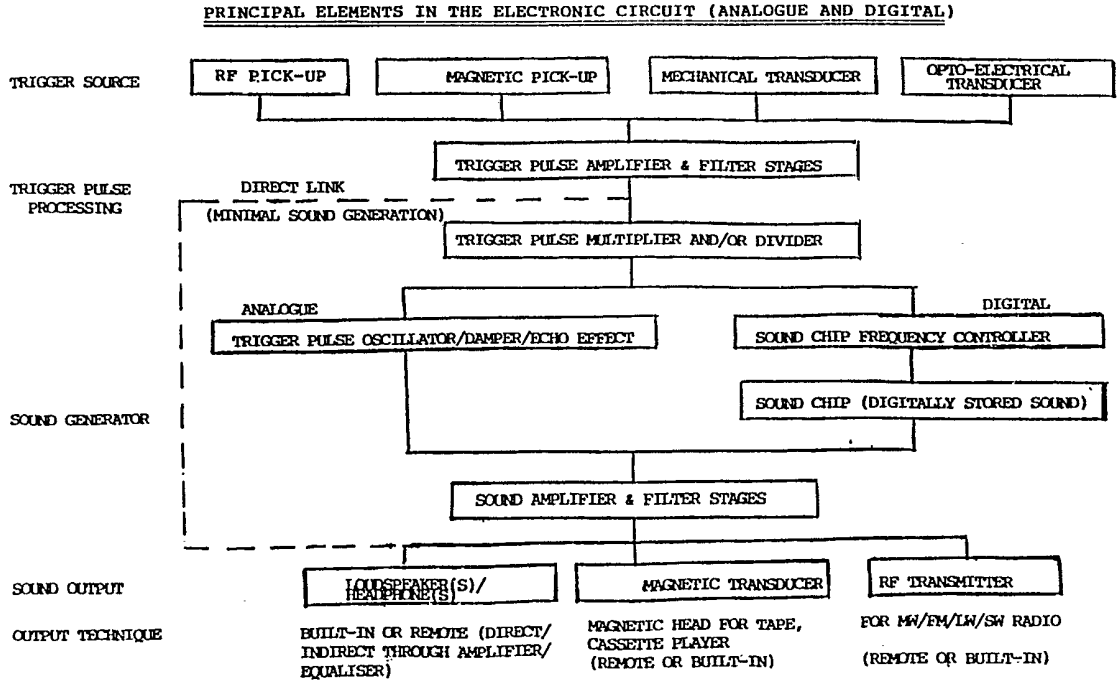

FIG. 6

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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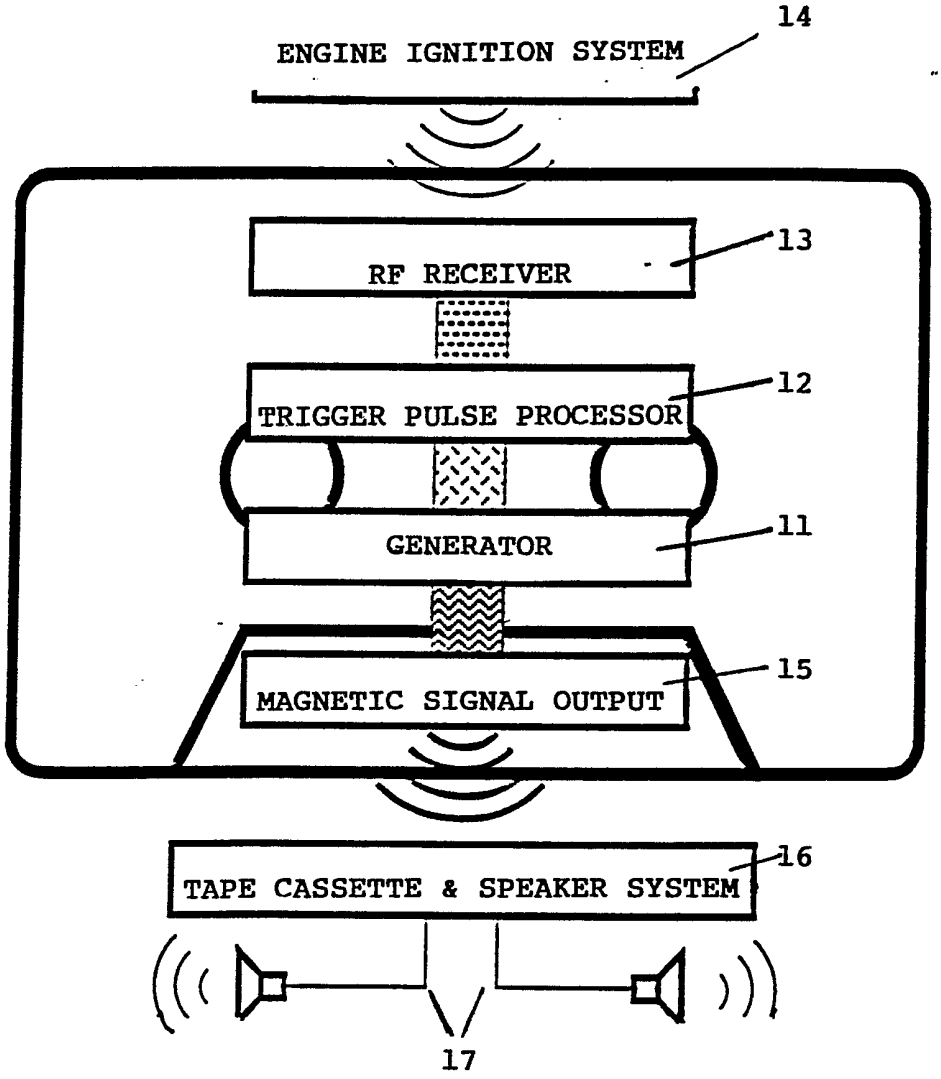
14
ENGINE IGNITION SYSTEM
13
RF RECEIVER
12
TRIGGER PULSE PROCESSOR
11
GENERATOR
15
MAGNETIC SIGNAL OUTPUT
16
TAPE CASSETTE & SPEAKER SYSTEM
17

FIG. 1

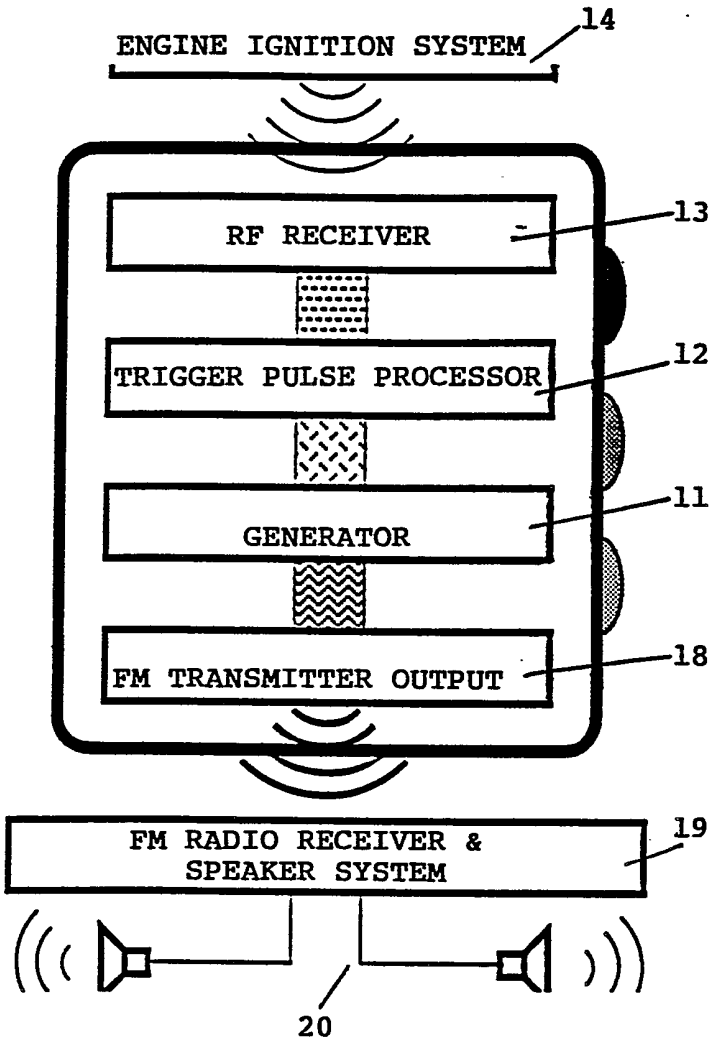
ENGINE IGNITION SYSTEM
14
RF RECEIVER
13
TRIGGER PULSE PROCESSOR
12
GENERATOR
11
FM TRANSMITTER OUTPUT
18
FM RADIO RECEIVER &
SPEAKER SYSTEM
19
20

FIG. 2

BICYCLE CHAIN

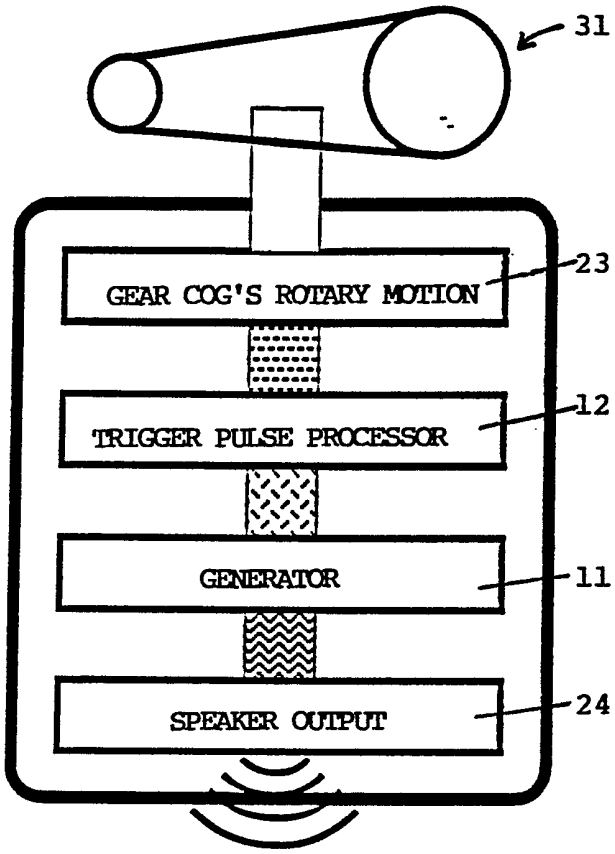

FIG. 3

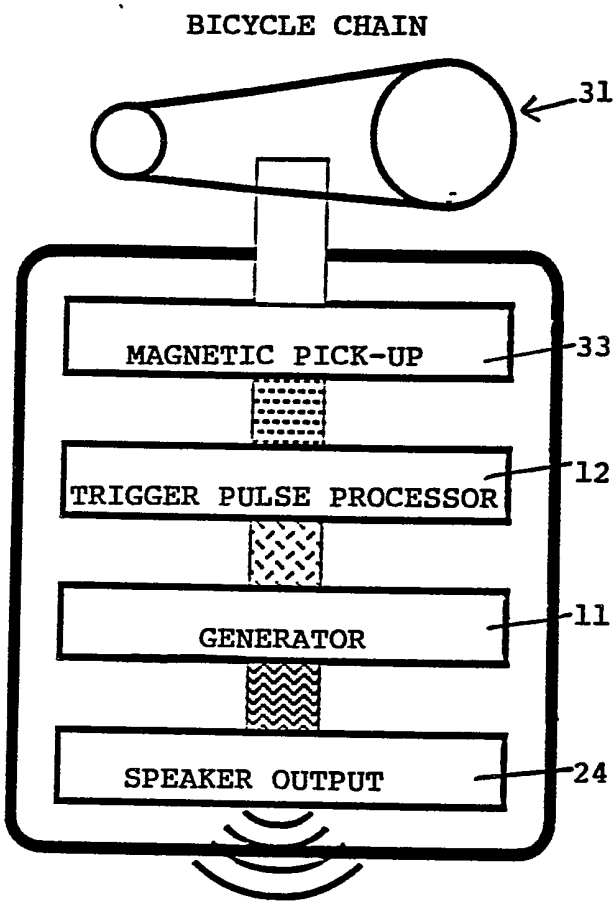
BICYCLE CHAIN
31
MAGNETIC PICK-UP
33
TRIGGER PULSE PROCESSOR
12
GENERATOR
11
SPEAKER OUTPUT
24

FIG. 4

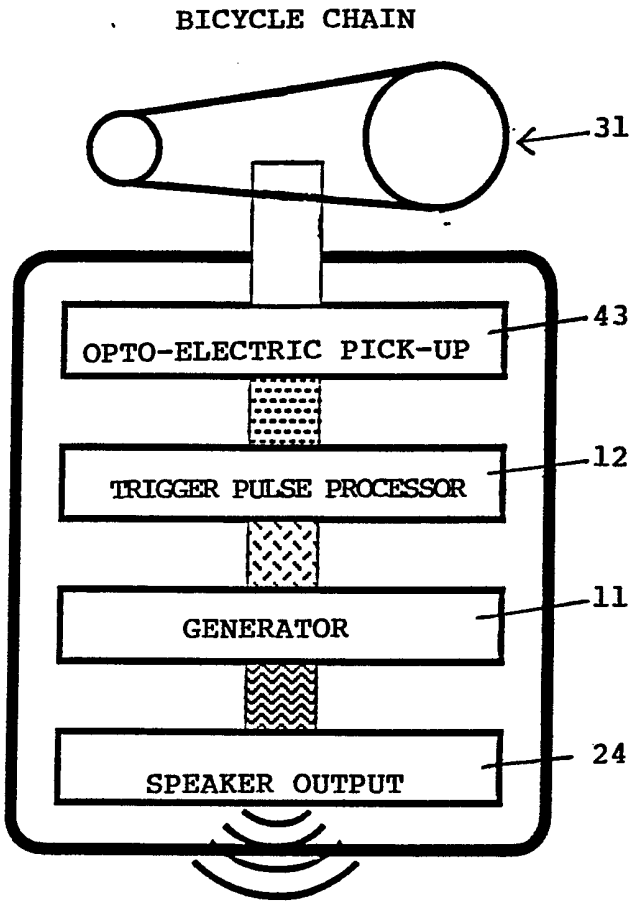
BICYCLE CHAIN
31
OPTO-ELECTRIC PICK-UP
43
TRIGGER PULSE PROCESSOR
12
GENERATOR
11
SPEAKER OUTPUT
24

FIG. 5

PRINCIPAL ELEMENTS IN THE ELECTRONIC CIRCUIT (ANALOGUE AND DIGITAL)

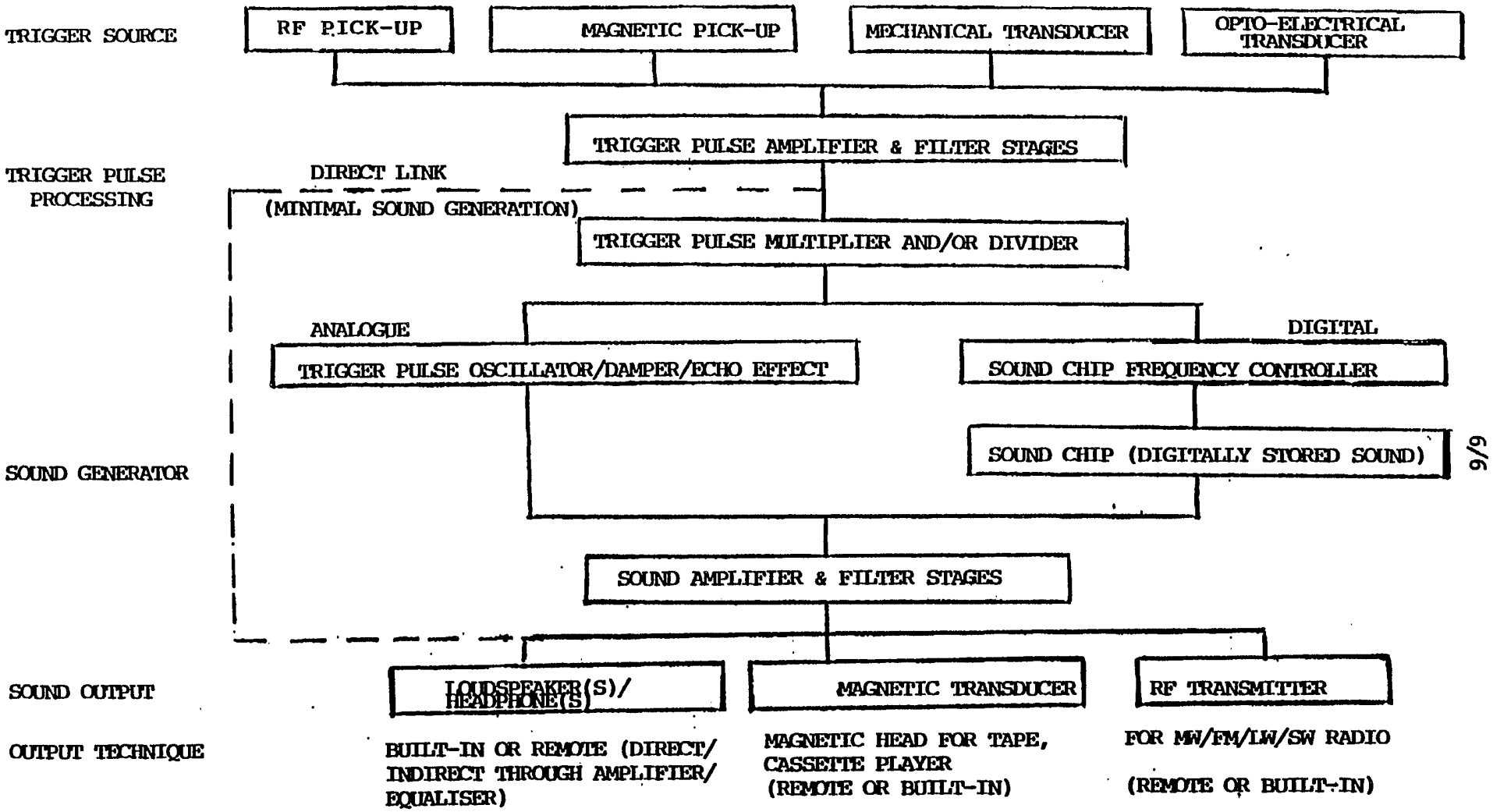

FIG. 6

AUDIO FREQUENCY SIGNAL GENERATING APPARATUS

The drive system for a vehicle generally comprises wheels and a drive system for the wheels. The drive system for a vehicle in the form of a car usually includes an internal combustion engine and the drive system for a vehicle in the form of a bicycle usually includes a pair of pedals, and a chain running between a pair of sprockets. The drive system generally emits a noise.

The present invention has the object of replacing or supplementing any noise emitted by the drive system with another noise and comprises audio frequency signal generating apparatus responsive to the drive system of a vehicle for generating audio frequency signals in response to a parameter of the drive system, the apparatus comprising a transducer for producing a control signal in response to said parameter and an audio frequency signal generator whose frequency and/or amplitude is variable in response to said control signal.

The audio frequency signals can be applied to a loudspeaker to make sound signals; alternatively, they can be converted to magnetic flux variations for application to the tape head of a magnetic tape sound reproducing apparatus, the sound signals being generated by the latter apparatus. Another alternative is for the audio frequency signals to be converted to modulating signals for a carrier wave, the modulated carrier wave signal being applied to a radio receiver and the sound signals being produced by the demodulating circuit of the radio receiver.

The transducer may be responsive to the drive system of the vehicle in a variety of ways. A preferred arrangement is for the transducer to be responsive to

radio frequency signals emitted by the drive system; this enables the transducer to be remote from the drive system without the need for a direct physical connection (eg fitted wires and cables) to a suitable source of signals in the drive system. Alternatively, the transducer may comprise a direct mechanical connection to the drive system, means for sensing magnetic flux variations due to movement of the drive system, opto-electric means for sensing light variations due to movement of the drive system. Another possibility, although less preferred due to its processing complexity and commercial expense, is for the transducer to comprise a microphone for sensing sounds emitted by the drive system.

Many vehicles already include sound reproducing systems in the form of cassette or compact disc sound reproducing systems or radio receivers. When the audio frequency signal generated by said genarator is in the form of the signal which would be produced by a tape cassette or compact disc played in such reproducing apparatus, the transducer and the frequency/amplitude varying means of the signal generator may be contained within a casing of the same shape as the tape cassette or compact disc so that it can be fitted into the reproducing apparatus and operated to produce its audio frequency signals which are then converted into sound signals by the reproducing apparatus. Similarly, the audio frequency signals can be generated in a form of the signals which can be sensed by a radio receiver and the corresponding sound signals generated by the output stage of the radio receiver.

The generator may comprise a selector device for selecting audio frequency signals of different characters to be generated in response to a given control signal.

The gererator may be adapted to be responsive to the speed of operation of the drive system by being responsive to electromagnetic radiation emitted by the drive system. We have found this much better than making it responsive to sound signals emitted by the drive system or to the position of a gear lever or throttle linkage. This is because the receiver picking up electromagnetic radiation does not have to be mechanically connected to the drive system or even have a transducer in close proximity to the drive system. Instead it can simply be carried in the pasenger compartment of the vehicle and does not need special fitting which might vary from vehicle to vehicle; it can be removed to another vehicle and taken to a place of higher security when not in use.

We have found a system in the HF range (300-3000kHz) works well, but it is believed any RF range could be used. Modern internal combustion engines emit suitable RF radiation representing engine speed and one or more such RF signals can be utilised for the present apparatus. An RF antenna can be conveniently and simply located in the passenger compartment of the vehicle and the need for special fitted wiring in the engine and passenger compartments is avoided.

On a vehicle having a drive system which does not emit appreciable electromagnetic radiation such as a bicycle, a particularly useful method of response to the drive

system while using the device's same basic circuit is a magnetic response system with a transducer responsive to magnetic field variations caused by the movement of the ferrous links of a chain in, or driven by, the drive system. Alternative method is to use a transducer responsive to optical variations caused by the movement of the chain links and/or sprocket teeth. Alternatively a direct mechanical connection can be made from the drive system to the transducer, preferably using an additional sprocket or a cam operated switch.

Examples of the invention will now be described with reference to the accompanying drawings, in which:-

Figures 1 and 2 represent two embodiments for use with an internal combustion engined vehicle,
Figures 3 to 5 represent three embodiments for use on a bicycle, and
Figure 6 is a block diagram showing various possible component combinations for achieving the invention.

In Figure 1, the example of the invention comprises an audio frequency signal generator 11 controlled by a trigger pulse processor 12, the trigger pulse processor being responsive to a transducer in the form of a radio frequency receiver 13 which in use is located in order to pick up RF signals emitted by the engine ignition system 14. The received signals are processed preferably as digital signals by the trigger pulse processor 12 to activate the generator 11 which generates audio frequency electrical signals which may be a simple signal or certain noises selected from a memory or sounds all of whose characters (eg amplitude

and frequency) depend on the character of the RF signals received at the receiver 13.

The signal output of the processor 12 can be entirely in analogue form, if desired. The drive circuit signals are applied to a magnetic signal output 15 which in use is adapted to cooperate with the input stage of a tape cassette reproducer 16. When such a reproducer is carried in the vehicle, as a fitment or simply as a piece of luggage, the magnetic signal output can be processed by the reproducer to operate its loudspeakers and the speakers 17 will emit sounds representing a selected engine noise whose frequency is a function of the frequency of the RF signals emitted by the engine ignition system.

In the embodiment according to Figure 2, the generator 11 is arranged to produce audio frequency signals to modulate a carrier signal to drive an RF transmitter 18 rather than the magnetic signal output 15 and the RF transmitter can be arranged to activate a radio receiver 19 carried on the vehicle as a fixture or as a piece of luggage so that the radio receiver sound reproduction system can be used to produce sound signals from its loudspeakers 20 in response to the RF transmitted signal activated by the drive circuit. In this embodiment, the genrator 11, the RF receiver 13 and trigger pulse processor 12 are arranged and constructed as in the embodiment of Figure 1 and contained with the RF transmitter 18 in a remote compact casing.

When the audio frequency signal generated by said generator at 11 is in the form of the signal which would be produced by a tape cassette or compact disc played in

appropriate reproducing apparatus, the components 11 to 15 of Figure 1 may be contained within a casing of the same shape as the tape cassette or compact disc so that it can be fitted into the reproducing apparatus and operated to produce its audio frequency signals which are then converted into sound signals by the reproducing apparatus. This maximises the portability and ease of operation.

The trigger pulse processor 12 of Figures 1 and 2 responds to the speed of operation of the internal combustion engine of the vehicle because the frequency of the RF signals generated by the ignition system 14 of the engine varies with the speed of the engine (not the vehicle). In the embodiments of Figures 3 to 5, the speed of movement of a part of the drive system 31 of a bicycle may be sensed by a transducer 23 which generates pulses which are processed by the trigger pulse processor 12 and causes the electrical drive circuit 11 to generate electrical signals in the audible frequency range which are applied to a loudspeaker 24.

The transducer 23 may be driven directly by an additional sprocket in the chain drive system of the bicycle as shown in Figure 3, or another form of direct mechanical connection or a cam operated switch, driven by the drive system, may be used to control the audio freqency signal generator 11.

In the embodiment of Figure 4, the transducer 33 comprises a magnetic sensor which is responsive to the movement of the ferrous links of the chain past the transducer. Since each link varies in density from a maximum at its end regions to a minimum at its centre,

the passage of each link will cause the pulses to be generated by the transducer. Similarly the passage of a sprocket and in particular its teeth could be sensed.

In the embodiment of Figure 5, the transducer 43 is optical and is responsive to the variation in light transmitted through the chain, light being transmitted at the centre portion of each link but blocked by each end portion. Similarly the passage of apertures or teeth of a sprocket could be sensed.

Various combinations of the embodiments of Figures 1 and 2 on the one hand and Figures 3 to 5 on the other hand can be used. A direct mechanical drive from the internal combustion engine of the embodiments of Figures 1 and 2 or magnetic or opto-electric sensing can be used to activate the trigger pulse generator feeding the processor 12. In Figures 1 and 2, it would be possible for the drive circuit to activate a loudspeaker forming part of the sound enhancing apparatus without the use of already existing sound reproduction apparatus. Similarly, it would be possible for either of the sound generation arrangements of Figures 1 and 2 to be used in conjunction with the drive circuit of Figures 3 to 5 provided of course that a tape reproducing device or radio receiver were carried on the bicycle to be activated by the magnetic signal generator or radio transmitter as appropriate. The embodiment of Figures 3 to 5 could be applied to any vehicle with a chain, sprocket, belt or appropriate drive system.

In the apparatus according to any of the embodiments of the invention, the components 11 to 15 may be mounted

permanently in or on the vehicle, or be carried as a piece of luggage. The drive circuit may be provided with selector means so that the electrical signals produced in the sound frequency range can be of selected character, for example, to represent different types of engines according to the character selected. This makes the apparatus according to these embodiments more versatile.

Figure 6 shows in block diagram form the principal elements of the embodiments described. In the upper row, examples 13,23,33,43 of the transducer are responsive to RF signals, magnetic flux variations, a mechanical movement and light or similar electromagnetic radiation variations. The transducer may produce an output in the form of trigger signals, in which case one or more trigger pulse amplifier and filter may be provided to produce a suitable control signal for the sound generator.

In the simplest system, the trigger signal itself is used to drive the sound initiator, which may be, as shown in the bottom row of the diagram, in the form of loudspeakers or headphones, a magnetic flux generator for application to sound reproduction apparatus responsive to magnetic flux variations, or an RF transmitter for supplying a radio receiver. The sound output may be produced in the same apparatus as the generator of audio frequency signals, or may be separated by a transmission channel, amplifier or equaliser.

In a more sophisticated system, the direct link from trigger signal to signal generator can be replaced by

analogue or digital processors. In either case, the processor may be preceded by multipliers and/or dividers for changing the frequency of the output signal from the transducer, and the output of the processor may be amplified and filtered. A digital processor may include a sound chip frequency controller and/or a source of digitally stored sound enabled by the signal from the transducer. An analogue processor may include signal oscillators, dampers and echo effect circuitry.

CLAIMS

1. Audio frequency signal generating apparatus responsive to the drive system of a vehicle for generating audio frequency signals in response to a parameter of the drive system, the apparatus comprising a transducer for producing a control signal in response to said parameter and an audio frequency signal generator whose frequency and/or amplitude is variable in response to said control signal.

2. Apparatus as claimed in claim 1 wherein said transducer is responsive to radio frequency signals emitted by said drive system.

3. Apparatus as claimed in claim 1 or claim 2 wherein said audio frequency signals are generated in the form of magnetic flux variations for application to the tape head of cassette reproduction apparatus.

4. Apparatus as claimed in claim 1 or claim 2 wherein said audio frequency signals are generated in the form of high frequency electromagnetic radiation variations for application to the pick-up head of a compact disc reproduction apparatus.

5. Apparatus as claimed in claim 1 or claim 2 wherein said audio frequency signals are generated in the form of modulating signals for a carrier wave for application of the modulated carrier wave to radio receiving apparatus.

6. Apparatus as claimed in claim 3 wherein said transducer and said generator are mounted in a casing

adapted to fit into the cassette receiving location of said cassette reproduction apparatus so that said audio frequency signals can be applied to the tape head of the cassette reproduction apparatus.

7. Apparatus as claimed in claim 4 wherein said transducer and said generator are mounted in a casing adapted to fit into the compact disc receiving location of said compact disc reproduction apparatus so that said audio frequency signals cna be applied to the pick-up head of said compact disc reproduction apparatus.

8. Apparatus as claimed in claim 2 and either of claims 6 and 7 comprising an antenna for radio frequency signals external to said casing and connected to said transducer.

9. Apparatus as claimed in claim 1 wherein said transducer is responsive to magnetic flux variations caused by movement of magnetic material in said drive system.

10. Apparatus as claimed in claim 1 wherein said transducer is responsive to electromagnetic radiation variations caused by movement of said drive system.

11. Apparatus as claimed in claim 1 wherein said transducer is responsive to a direct mechanical connection from said drive system.

12. Audio frequency signal generator apparatus as claimed in claim 1 substantially as hereinbefore described with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under section 17 (The Search Report)

Application number
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Relevant Technical fields

(i) UK Cl (Edition L) G5J (JEBA, JECB)
A65 (S19D5)

(ii) Int Cl (Edition 5) A63H, B60Q, G10K

Search Examiner
MISS S E WILLCOX

Databases (see over)
(i) UK Patent Office

(ii)

Date of Search
26 JANUARY 1993

Documents considered relevant following a search in respect of claims 1

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
Y,P	GB 2252657 A LOTUS (see page 3, lines 11-33 and page 7, lines 11-23)	1, 10, 11 at least
X,Y	GB 2219873 SENOC (see whole document)	1 at least
X	GB 2056152 NYMAN (see whole document)	1, 10 at least
Y	WO 90/13109 GROUP LOTUS	1 at least
Y	DE 3420463 BRUCKNER (see absract)	1, 10 at least

Category	Identity of document and relevant passages	Relevant to claim(s.

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