March 20, 1962 G. L. BEERS 3,026,411

CLOCK CONTROLLED RECEIVER

Filed Feb. 18, 1959 2 Sheets-Sheet 1

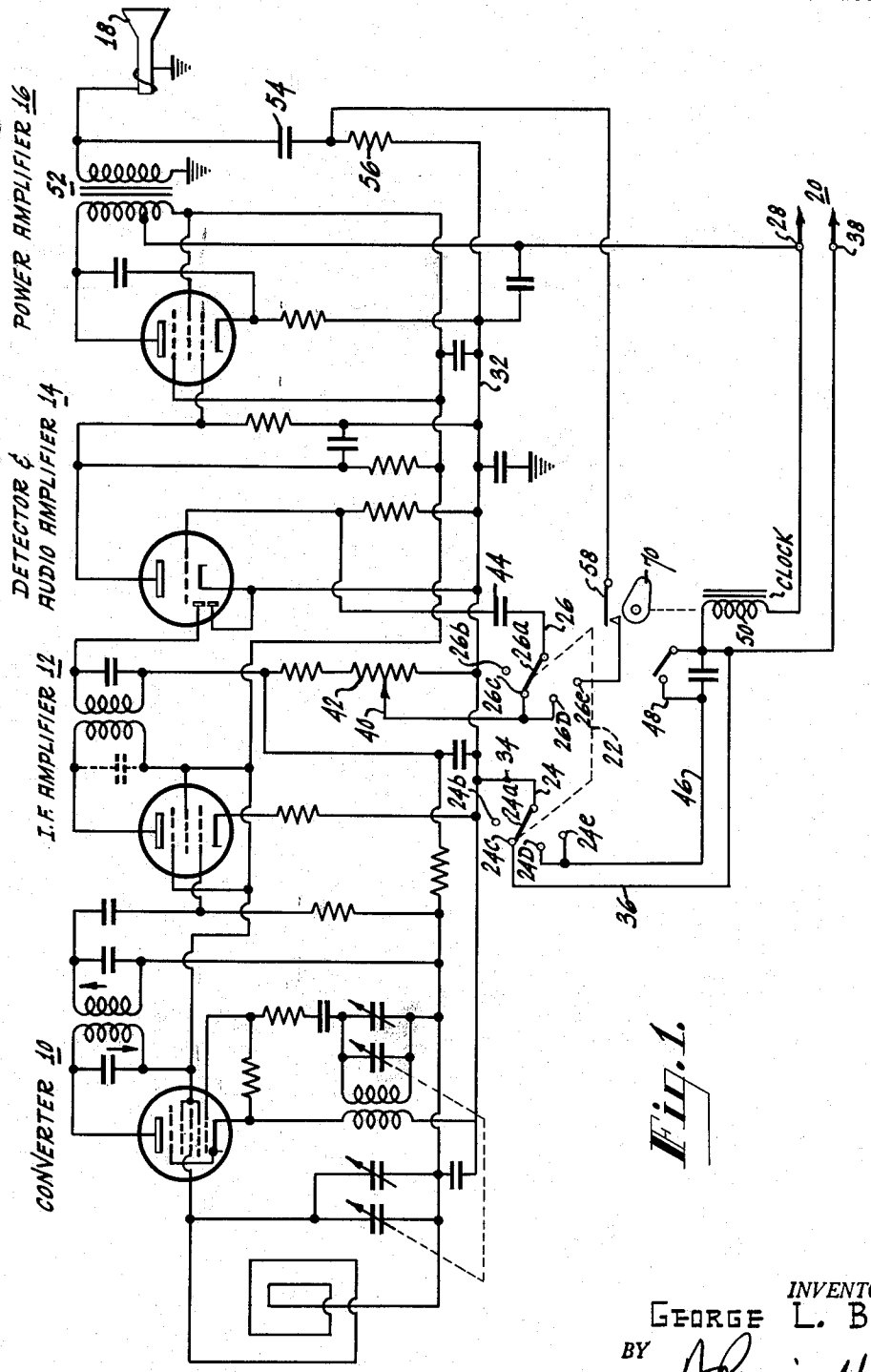


Fig. 1.

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Filed Feb. 18, 1959 2 Sheets-Sheet 2

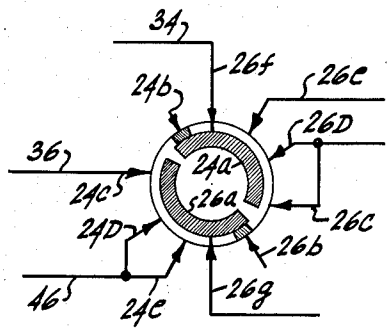


Fig. 2.

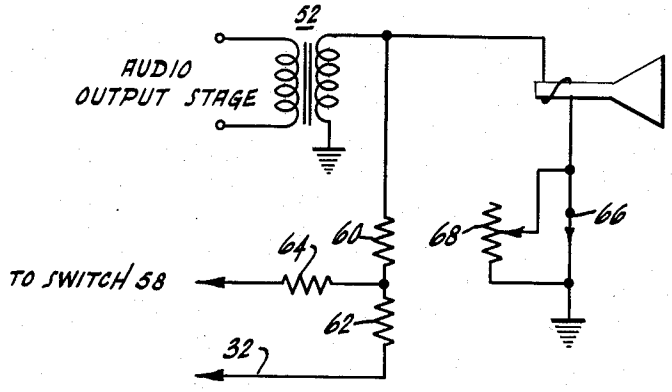


Fig. 3.

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CLOCK CONTROLLED RECEIVER

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This invention relates to radio receivers of the type which are adapted to be energized at a predetermined time by a clock controlled switch to produce an audible alarm.

Certain types of clock controlled receivers heretofore known have provided the option of a radio program type alarm or a buzzer type alarm. With the radio program type alarm the receiver is energized at a preset time to receive and translate a preselected radio program. With the buzzer alarm, a conventional alarm device usually an electrically operated buzzer associated with the clock mechanism is energized at the preset time to produce an audible time or buzz.

It is an object of this invention to provide an improved and simplified clock controlled receiver which provides the option of a radio program type alarm or a tone alarm of a more pleasing character than conventional electromechanical buzzer alarms yet effective to awaken a sleeping person.

Another object of this invention is to provide an improved clock receiver of the type including a tone alarm which does not require the addition of a separate alarm device ordinarily associated with the clock mechanism.

A further object of this invention is to provide an improved clock receiver of the type including a tone alarm wherein greater ffexibility is provided in selecting such qualities of the resulting alarm tone as frequency or volume.

The clock controlled receiver of the present invention includes function selector control means for optionally selecting the radio program type or tone type alarm. In the radio program type alarm position of the function selector control means, power is supplied to the receiver at a preset time by a clock controlled switch so that a received broadcast signal may be reproduced in the usual manner. In the tone type alarm position of the function selector control means, the output circuit of the audio power amplifier is regeneratively coupled to a preceding point in the signal channel in a manner to produce oscillations, so that when the receiver is energized at the preset time, an audible tone is produced by the receiver loadspeaker. In this manner the buzzer type alarm can be provided on a clock controlled receiver without requiring the additional expense and space required by a conventional alarm device. Furthermore, a greater degree of flexibility is provided for controlling the qualities of the alarm tone in that the frequency and volume can be more readily controlled by the proper selection or adjustment of the circuit elements.

The novel features that are considered characteristic of this invention are set forth in the appended claims. The invention itself, however, both as to its organization and method of operation, as well as additional objects and advantages thereof, will best be understood from the following description when read in connection with the accompanying drawings, in which:

FIGURE 1 is a schematic circuit diagram of a clock controlled radio receiver embodying the invention;

FIGURE 2 is a diagrammatic representation of a practical function selector control switch for the receiver shown in FIG. 1; and

FIGURE 3 is a modification of the loudspeaker circuit of FIGURE 1, for providing a different buzzer tone and selective control of the buzzer volume.

The receiver circuit of FIGURE 1 includes a pentagrid converter **10**, an intermediate frequency (I.F.) amplifier **12**, a detector and audio amplifier **14** and an audio power amplifier **16** for driving a loudspeaker **18**. Energizing potentials for the various signal translating stages of the receiver are provided by a power supply **20** which comprises conventional means for supplying a direct voltage such as a battery or a rectifier circuit adapted to be connected to an A.C. power main or the like. The aforementioned circuits are of conventional design and further description of them or their operation so far as the reception and translation of radio signals are concerned is deemed unnecessary.

The receiver includes a function selector control means **22** which is mechanically coupled to the switch sections **24** and **26**. The function control means is adjustable to: (1) turn the receiver off; (2) turn the receiver on; (3) set the receiver for radio alarm; or (4) set the receiver for tone alarm. As shown in the drawings, the switches **24** and **26** are in the receiver on position.

The switch **24** is in the power circuits of the receiver and the switch **26** is connected in the signal conveying circuits. To turn the receiver off, the movable contacts **24*a*** and **26*a*** of these switches are moved to engage the open contacts **24*b*** and **26*b*** respectively. In this position of the switch **24** the power supply circuit is open and the receiver is deenergized.

To turn the receiver on, the movable contacts **24*a*** and **26*a*** of the switches are moved to engage the contacts **24*c*** and **26*c*** respectively. This causes an energizing voltage to be applied to the various signal translating stages, and connects the receiver to translate received broadcast signals.

The B+ operating current path for the receiver may be traced from the positive terminal **28** of the power supply **20** through the anode to cathode paths of the various signal translating stages back to the receiver ground line **32**. From the ground line **32** the B+ current flows through a conductor **34**, switch **24** and a conductor **36** back to the negative terminal **38** of the power supply **20**.

The signal path in this position of the function control means **22** is from the tap **40** on a conventional volume control potentiometer **42** through the switch **26** and a capacitor **44** to the control electrode of the audio amplifier portion of the stage **14**.

When the function selector control means **22** is set to the radio alarm position, the movable contacts **24*a*** and **26*a*** are connected to the fixed contacts **24*d*** and **26*d*** respectively. The signal path for this setting is exactly the same as described above for the "receiver on" position. The power supply circuits, however, are completed from the switch **24** through a conductor **46** and a clock controlled switch **48**, back to the negative terminal **38** of the power supply **20**.

The electric clock is schematically represented by the winding **50**, the terminals of which are connected across the power supply terminals **28, 38**. As is conventional with clock controlled receivers, the clock may be set to close the contacts of the switch **48** at a predetermined time usually up to about 12 hours in advance. After the clock alarm time has been set and the function control selector switch has been adjusted to the radio alarm position, the receiver will remain deenergized until the preset time. At the preset time, the clock mechanism causes the contacts of the switch **48** to close, thereby energizing the receiver to translate signals broadcast on a carrier frequency to which the receiver is tuned.

In the tone alarm position of the function selector switch **22**, the movable contacts **24*a*** and **26*a*** are connected with the fixed contacts **24*e*** and **26*e***, respectively. Since the fixed contacts **24*d*** and **24*e*** are connected together, the power circuits are completed in the same man-

ner as described for the radio-alarm position of the function selector switch. However, the control grid of the audio amplifier portion of the stage 14 is disconnected from the volume control potentiometer 42 and thereby the preceding stages of the receiver, and is regeneratively coupled to the secondary winding of the output transformer 52.

One side of the output transformer secondary winding and the speaker winding is indicated as being connected to the conductive chassis of the receiver but could as well be connected to the ground line 32 if desired. The other side of this secondary winding is connected through a capacitor 54 and a resistor 56 to the ground line 32. The junction of the resistor 56 and capacitor 54 is connected through a switch 58 and the switch 26 to the grid of the audio amplifier portion of the stage 14. The feedback through this network is regenerative, and causes the audio amplifier portion of the receiver to oscillate, and thereby causes the loudspeaker 18 to produce an audible tone of pleasing quality. The frequency of the alarm tone can be controlled by proper design of the feedback circuit using conventional design techniques. For example, with a feedback circuit including the resistors 60, 62 and 64, as shown in FIGURE 3, the frequency of the alarm tone can be lowered.

As is also shown in FIGURE 3, control of the alarm tone volume may be effected by the addition of a switch 66 and a variable resistor 68. The switch 66 and variable resistor 68 are connected in parallel between the low signal potential side of the speaker winding, and the conductive chassis. The switch 66 is preferably ganged with the switches 24 and 26 for control by the function selector control means 22, so that the contacts thereof are opened only in the buzzer alarm position of function selector control means. With the contacts of the switch 66 open, the variable resistor 68 is connected in series with the speaker winding, and can be adjusted to control the amount of energy delivered thereto. This, of course, determines the volume or loudness of the tone alarm emanating from the speaker. In all other positions of the function selector control means 22, the variable resistor 68 is shorted out by the switch 66.

Another feature of the invention is that an interrupted tone is produced to provide a more effective alarm signal. Referring again to FIGURE 1, the switch 58 in the regenerative feedback is adapted to be periodically opened by a cam 70 on the clock mechanism. Of course other means such as a blocking oscillator may be used to produce the interrupted tone. If desired, the switch 58 and the cam 70 may be eliminated to simplify the clock mechanism and to reduce the cost of the receiver.

A practical embodiment of the switches 24 and 26 is shown in FIGURE 2. This switch is of the type commonly referred to as a wafer switch, and includes an insulating support having fixed contacts disposed in spaced relation about the periphery thereof. The fixed contacts 24*b*, 24*c*, 24*d*, 24*e*, 26*b*, 26*c*, 26*d* and 26*e* respectively correspond to the contacts bearing the same reference numerals on the switches 24 and 26 of FIGURE 1, and the contacts 24*f* and 26*f* correspond to the unnumbered pivot contacts for the movable contacts 24*a* and 26*a* respectively of FIGURE 1.

The various contacts are positioned to cooperate with a pair of conductive rotor elements 24*a* and 26*a* respectively. The rotor elements are mounted for rotation by the function selector control means, which is not shown in FIGURE 2. Suitable detent and stop means, not shown, may be associated with the rotor elements to provide a positive stop at each of the function selecting positions, and to provide the desired number of such positions.

It will be noted that the fixed contacts 24*f* and 26*f* are longer than the other contacts, and are in contact with the rotors 24*a* and 26*a* respectively for all positions thereof. The rotors 24*a* and 26*a* are provided with radially extending tabs which engage one or another of the shorter fixed contacts depending on the position of the function selector control means. In the position shown, the switch is in the receiver off position, and for successive counter-clockwise positions the switch is in the receiver on position, radio alarm position, and tone alarm position.

In accordance with the foregoing it will be seen that the clock controlled receiver of the invention provides the advantages of a buzzer or tone type alarm using circuits already incorporated in the receiver and thereby eliminating the expense of a separate alarm device associated with the clock mechanism. Furthermore, in addition to enabling a greater degree of flexibility with respect to the tone quality and volume of the tone alarm, a tone type alarm in accordance with the present invention requires less power than electrically operated alarm devices ordinarily associated with electric clock mechanism. This is of particular importance where the receiver is to be battery operated.

Having described my invention what is claimed is:

1. In a clock controlled radio receiver of the type including means providing signal translating stages for deriving audio signal information from received audio signal modulated carrier waves, an audio frequency amplifier stage having an input circuit and an output circuit, a sound reproducing means coupled to said output circuit, means providing an energizing power source for said receiver, an electric clock connected to receive power from said source, a switch coupled to the mechanism of said clock to be actuated from an open condition to a closed condition at a predetermined time, circuit means including said switch for applying said power from said source to said signal translating stages and said audio frequency amplifier stage when said switch is in the closed condition thereof and for breaking the circuit from said source to said signal translating stages and said audio frequency amplifier when the switch is in the open condition thereof; the combination of a variable resistor and function selector control means having a first position for connecting said audio amplifier to said signal translating stages to apply audio signal information from said signal translating stages to said audio amplifier input circuit to provide a radio alarm when said switch is in the closed condition thereof, and a second position for connecting the output circuit of said audio amplifier with the input circuit thereof in regenerative relation to cause said audio amplifier to oscillate and provide a tone alarm when said switch is in the closed condition thereof and for connecting said variable resistor in circuit with said sound reproducing means to provide an adjustable control of the volume of the tone alarm.

2. A clock controlled radio receiver comprising means providing signal translating stages for deriving audio signal information from received audio signal modulated carrier waves, an audio frequency amplifier stage having an input circuit and an output circuit, a sound reproducing means coupled to said output circuit, means providing an energizing voltage source for said receiver, an electric clock coupled to said voltage source, said clock including a switch coupled to the mechanism of said clock to be actuated from an open condition to a closed condition at a predetermined time, circuit means including said switch for applying said voltage from said source to said signal translating stages and said audio frequency amplifier stage when said switch is in the closed condition thereof and for breaking the circuit from said source to said signal translating stages and said audio frequency amplifier when the switch is in the open condition thereof, a resistance capacitance network, a second switch, a cam operated by said clock for periodically opening said switch, function selector control means having a first position for connecting said audio amplifier to said signal translating stages to apply audio signal information from

said signal translating stages to said audio amplifier input circuit to provide a radio alarm when said switch is in the closed condition thereof and a second position for connecting said resistance capacitance network and said second switch in series between the output circuit of said audio amplifier with the input circuit thereof in regenerative relation to cause said audio amplifier to oscillate and produce an interrupted tone alarm when said switch is in the closed condition thereof, a variable resistor, and a third switch actuated by the function selector control means in the second position thereof to connect said variable resistor in circuit with said sound reproducing means to provide an adjustable control of the tone alarm volume.

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