

[72] Inventor **Eugene M. Cummings**
 Park Ridge, Ill.
 [21] Appl. No. **861,098**
 [22] Filed **Sept. 25, 1969**
 [45] Patented **July 13, 1971**
 [73] Assignee **Zenith Radio Corporation**
 Chicago, Ill.

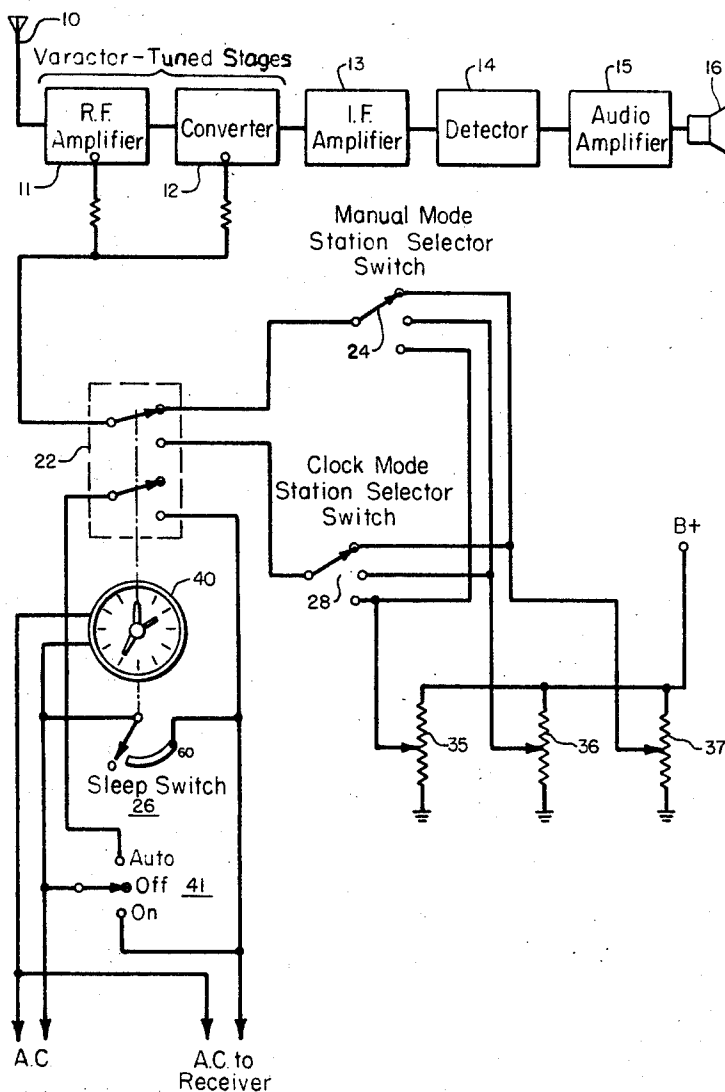
Primary Examiner—Robert L. Richardson
Attorney—John J. Pederson

[54] **CLOCK RADIO RECEIVER HAVING
 PRESETTABLE TIME RESPONSIVE AUTOMATIC
 VARACTOR TUNING WITH MEMORY FEATURES**
 2 Claims, 2 Drawing Figs.

[52] U.S. Cl. 325/396
 [51] Int. Cl. H04b 1/16
 [50] Field of Search 325/395,
 396, 452, 457, 464, 465

[56] **References Cited**
UNITED STATES PATENTS
 2,805,331 9/1957 Wolford 325/396

ABSTRACT: A clock radio of the type including a voltage variable capacitance diode in its tuned circuitry is disclosed in which adjustable voltage sources are arranged with switches and the radioclock to permit both the choice of a station for normal operation by the adjustment of a first voltage source applied to the variable capacitor, and the like preselection of another station on a second voltage source to be applied automatically at a later preset time by a clock-controlled switch. The former station choice can always be immediately restored without any returning by causing the appropriately adjusted voltage source to be switched back into the tuned circuit. In addition, provision is easily made for allowing the listener to select both his normal mode station choice and his clock mode station choice from a number of preset station possibilities.



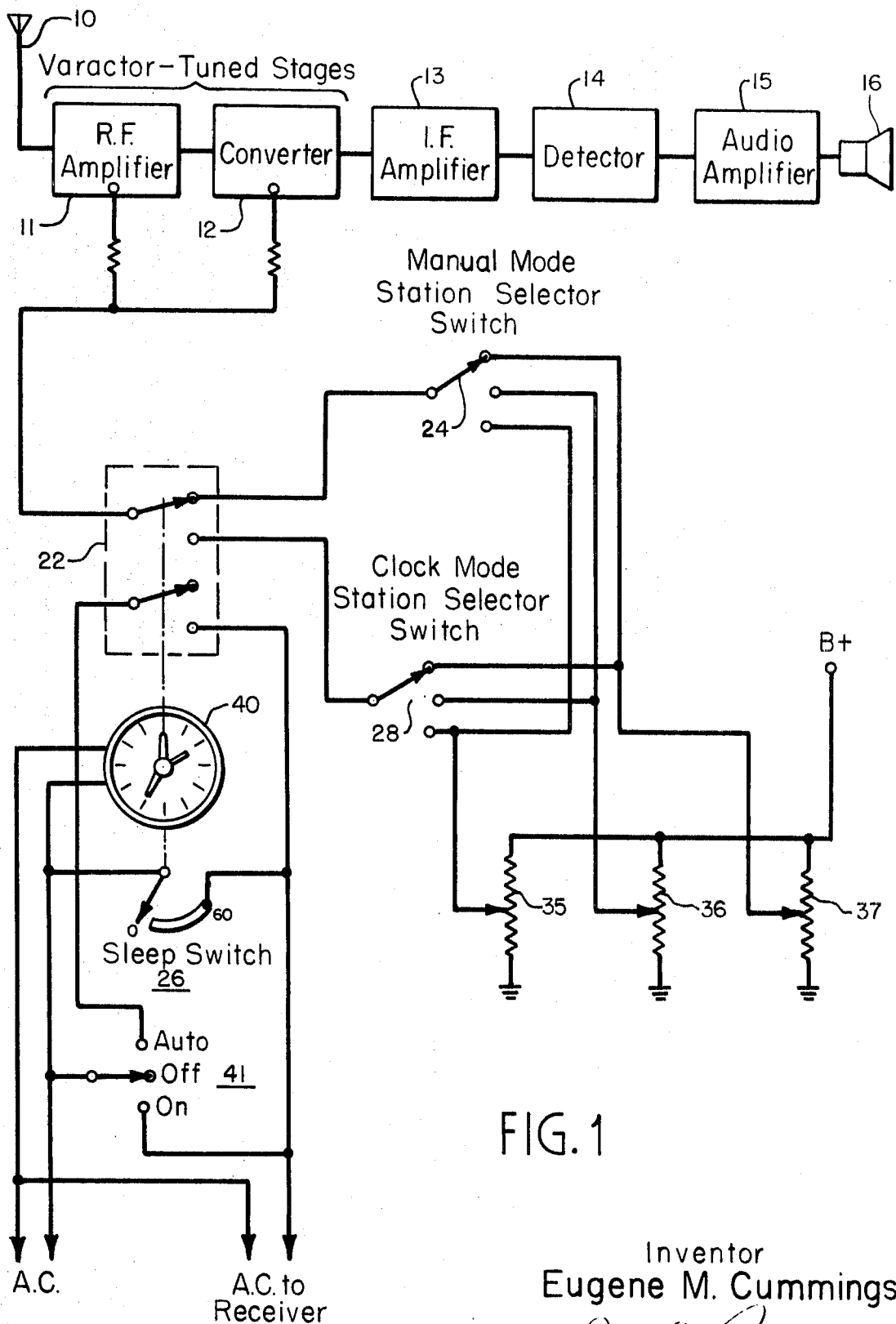


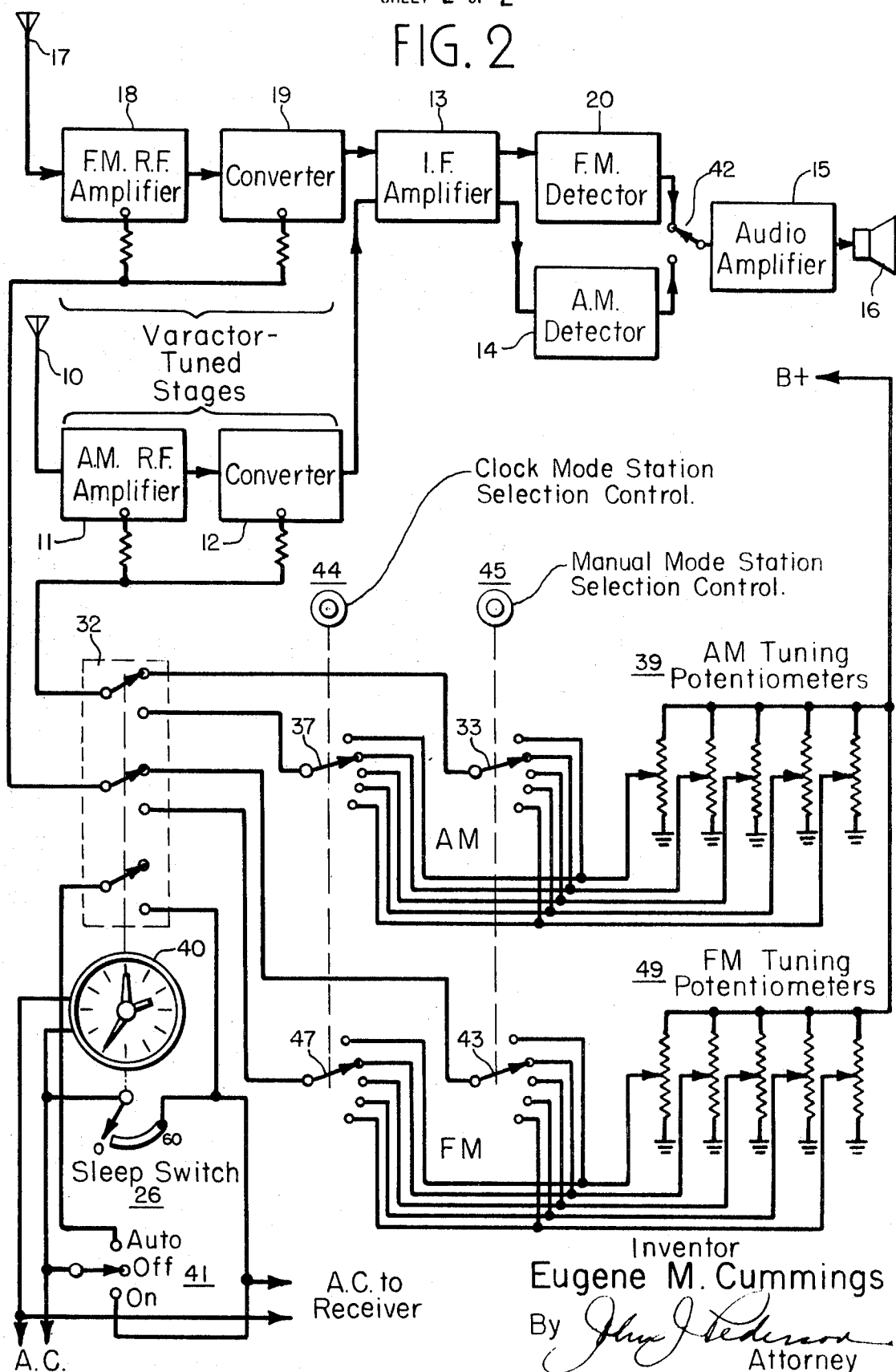
FIG. 1

Inventor
Eugene M. Cummings

By *John J. Pederson*
Attorney

SHEET 2 OF 2

FIG. 2



CLOCK RADIO RECEIVER HAVING PRESETTABLE TIME RESPONSIVE AUTOMATIC VARACTOR TUNING WITH MEMORY FEATURES

BACKGROUND OF THE INVENTION

This invention relates to a clock radio and the like incorporating automatic time responsive tuning features. More particularly, it relates to clock radios which use varactor tuning and which are capable of permitting the listener to choose one station, preferably from a number of preset possibilities, for the ordinary mode of operation and to likewise preselect another station for operation during the clock mode, where operation in either mode is carried out without disturbance or cancellation of the station choice for the other mode.

Although the usual clock radio is a great convenience, it often gives rise to the annoyance of trying to find a station which has both congenial bedtime music and a congenial wake-up program. The radio disclosed in copending application, Ser. No. 850,050, filed Aug. 14, 1969, Clement R. Tompson, "Clock Radio With Time-Responsive Automatic Turning," obviates the difficulty; it has the ability to automatically tune a presettable station choice at the time preset for awakening which is different than the station being tuned at shutoff. However, despite such greatly increased convenience of operation, even this radio inherently lacks the advantage of "memory" of the station which was being tuned at shutoff; that is, the bedtime station setting cannot be retained once the clock mode comes into operation to cause the radio to automatically tune to the new station at the preset wake-up time. The bedtime station choice must then be retuned again by the listener. Also, this radio, as well as other prior art clock radios, cannot be adapted to incorporate an uncomplicated means of preregistering a number of station possibilities for both normal radio operation and operation in the clock mode, out of which a single station choice can immediately be made for each of these two modes. Even the limited preselect features which have appeared have been usually too mechanically or electrically cumbersome, or too complex, for economical use in smaller radios.

Accordingly, the main object of the invention is to provide a clock radio which automatically tunes a preselected new station at wake-up time different from that being tuned at shutoff, yet in any case retains the setting of the station choice for each mode to allow either mode with its accompanying station choice to be immediately restored without retuning.

Another object is to provide a simple inexpensive clock radio in which one station for the clock mode and another station for ordinary operation mode can be immediately selected from a number of listener-preset station possibilities.

In accordance with the invention, a clock radio or the like includes a broadcast receiver for receiving programs broadcast on any of a plurality of operating stations, a clock, and a tuned circuit including a capacitance responsive to an applied voltage for tuning the receiver to any desired one of the operating stations. Mode switch means are included which are operable to any of three positions, including an ON position for turning the receiver on, an OFF position for turning it off, and a conditioning position for conditioning it to turn on automatically at a preselected future time. A first voltage source is included which is connectable to said voltage-responsive capacitance when said mode switch is in the ON position and adjustable to cause selection by said tuned circuit of a first operating station. A second adjustable voltage source independent of the first voltage source is included which is connectable to the voltage-responsive capacitance when the mode switch is in the conditioning position and is adjustable to affect preselection of a second station by the tuned circuit. Sleep switch means are included which are operable to override the mode switch means and turn the receiver on to receive the first station selected by means of the first adjustable voltage source and to turn the receiver off automatically

after the passage of a predetermined time interval. Also included are means including a switch actuated by said clock at said preselected future time for connecting said first voltage source to said voltage-responsive capacitance when said mode switch is in the ON position, and for turning said receiver on and connecting said second voltage source to said capacitance at said preselected time when said mode switch is in the conditioning position, thereby automatically tuning said preselected second station at said preselected time while leaving undisturbed the adjustment for said first station to allow its immediate restoration without retuning.

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 further objects and advantages thereof, may best be understood, however, by reference to the following description taken in conjunction with the accompanying drawings, in the several figures of which like reference numerals identify like elements, and in which:

FIG. 1 is a schematic diagram of a clock radio with provision for allowing one station to be tuned for immediate operation and another station to be preset for later automatic tuning in accordance with a preferred embodiment of the invention; and

FIG. 2 is a schematic diagram of an alternate clock radio based on the FIG. 1 embodiment in which provision is made for a plurality of presettings out of which the normal operation station and clock mode station are selected in accordance with the invention.

The apparatus in block form shown in FIG. 1 is an AM radio receiver of conventional design and comprises an antenna 10 coupled to an RF amplifier stage 11, which incorporates a tuned circuit including a voltage variable capacitance such as a varactor diode. Converter 12 is coupled to RF amplifier stage 11, converts the frequency of the received signals to an IF frequency, and is also varactor tuned. This stage is then followed in conventional fashion by the usual IF amplifier 13 and detector 14 stages, finally followed by an audio amplifier 15 coupled to a speaker 16. Both varactor-tuned stages are connected to one of the pole terminals of a double-pole double-throw switch 22 which in turn connects them to either the armature terminal of a manual mode station selector rotary switch 24 or the armature terminal of a clock mode station selector rotary switch 28. The arms of each of a plurality of station tuning potentiometers 35, 36 and 37 are respectively connected to one terminal on each of the station selector switches 24 and 28, thus completing the possible circuits from the varactor-tuned stages to one of the potentiometers, with the other two terminals of such potentiometer completing a circuit to the receiver power supply B+.

The usual AC supply current is connected through a mode selector switch 41 to the receiver power supply through either the terminal associated with the "ON" position or through the terminal associated with the "AUTO" position, the clock controlled position. In the latter case the AC current is switched to the receiver power supply through the second pole of switch 22, which is coupled to and controlled by clock 40. The receiver power supply may also be energized from the AC supply current by means of sleep switch 26.

Thus the radio is normally switched on by manipulation of mode selector switch 41 from its "OFF" to its "ON" position; likewise, the radio is placed in the clock-controlled automatic mode by a manipulation of the mode switch to the "AUTO" position. When the radio is in its normal manual "ON" mode, double-pole double-throw switch 22 connects the varactor-tuned stages 11 and 12 to station selector switch 24 which permits selection of any one of the voltage levels supplied by the arms of potentiometers 35, 36 and 37 as the control voltage to be conducted to the varactor-tuned stages. Each of these potentiometers can be adjusted in advance by the listener to supply a voltage corresponding with the station which it is

desired to preselect on that potentiometer, and the station selector switch 24 used to select one of the stations so preset, or the station switch can be used to select any potentiometer which is then manipulated to vary the voltage level presented to the varactor-tuned stages 11 and 12 and thereby manually tune an operating station in the conventional manner.

During the course of such usual operation, or even when the mode switch is "OFF," the clock mode switch 28 can likewise be used by the listener to preselect any one of the potentiometers with its preset station for future use in the clock mode by connecting that potentiometer to the clock-controlled switch 22. Alternatively, any one of the potentiometers can be adjusted to a setting corresponding to any desired wake-up station, and switch 28 adjusted to connect that potentiometer with switch 22. The clock may then be preset to the desired wake-up time, and mode switch 41 switched to the "AUTO" position before retirement, thereby placing the radio in the clock mode. The conventional sleep-switch feature 26 may be used to hold the radio operative on the station choice of the normal operating mode during a predetermined time interval while the listener falls asleep, then allowing the radio to turn-off.

At the desired wake-up time, clock 40 actuates clock-controlled switch 22, thus energizing the receiver power supply and connecting through clock mode station selector 28 the potentiometer preset to the desired clock mode station with the varactor-tuned stages 11 and 12. Then at the preset time, the receiver is automatically both turned on and its varactor-tuned stages tuned to the station previously selected for wake-up.

The automatic returning to a new station when in the clock mode does not involve disturbing the adjustment of the manual mode station selector 24 or station adjustments preset on the tuning potentiometers. All tuning controls remain as they were throughout the automatic cycle, and the radio exhibits a "memory" in that the station which had been tuned before activation of the clock-controlled mode may be restored at any time without retuning any of the tuning potentiometers or disturbing the station selectors, simply by switching back to the manual mode with mode selector switch 41 restored to the "ON" position. The receiver power supply is thereby again energized independently of the clock switch terminals, and switch 22 again connects manual mode station selector 24 and its station selection, which will be the station last chosen for operation in the manual code. Of course, station selector 24 may then also be manipulated to connect any of the other presets to the varactor stages instead. Likewise, when the radio is being operated in the manual mode, the station preset on station selector 28 for clock mode operation need not be disturbed by such operation and may remain registered for future use, so that all the listener need do is to select the clock mode by means of switch 41.

The FIG. 2 embodiment is a development of the basic circuit configuration of FIG. 1 to include the additional features of an FM option, another set of station selector switches to accommodate the FBM option, and five preselected possibilities each for both AM and FM options from which to choose operating station. The receiver apparatus is similar to that of FIG. 1, but with antenna 17 and the varactor-tuned FM/RF amplifier 18 and FM converter 19 added in parallel with corresponding AM counterparts and likewise feeding IF amplifier 13. FM detector 20 is also added to receive the output of IF amplifier 13 in parallel with the AM detector 14; AM/FM preference switch 42 determines which of the two detectors is coupled to audio amplifier 15. A triple-pole, double-throw clock-controlled switch 32 is used in place of the former double-pole, double-throw switch 22 so that the varactor-tuned FM stages can also be connected to their clock mode and manual mode station selector switches 47 and 43. These switches are respectively ganged with their AM counterparts 37 and 33 so that station selections for the clock mode are controlled by clock mode station selector control 45 and station selections for the manual mode by manual mode station

selector control 44. The five FM station tuning potentiometers 49 are each connected to one contact of both switch 43 and switch 47, with the five AM station tuning potentiometers 39 being likewise connected to the AM station selector switches 33 and 37, just as in the FIG. 1 embodiment.

Selection of stations for the manual mode and preselection of stations for the clock mode are done through controls 44 and 45, respectively, as in the FIG. 1 radio except that any one of five, rather than three, presettable possibilities can now be chosen from station tuning potentiometers 39 and 49 for each mode in both AM and FM options, respectively, with the option choice being controlled by the AM/FM preference switch 42. Mode selection is as in the FIG. 1 embodiment, as is the automatic tuning and memory feature allowing the radio to retain the tuning preferences of each mode while the operating mode itself is changed between clock and manual.

Clock radios and the like constructed in accordance with the invention are quite susceptible of easy, noncritical, and foolproof assembly to fit readily the needs of mass production techniques. No cumbersome devices are required; all components are in themselves uncomplicated, inexpensive and readily available, yet the invention provides even the inexpensive clock radio with advantages in flexibility of operation which the most costly prior art clock radios do not approach, particularly in enabling the registration of the station selected for each mode, as well as any nonselected preset stations, to be retained through automatic and manual changes from one operating mode to the other.

While particular embodiments of the invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention in its broader aspects, and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of the invention.

I claim:

1. A clock radio or the like comprising:

a broadcast receiver for receiving programs broadcast on any of a plurality of operating stations;

a clock;

a tuned circuit including a capacitance responsive to an applied voltage for tuning said receiver to any desired one of said stations;

mode switch means operable to any of three positions, including an ON position for turning said receiver on, an OFF position for turning it off, and a conditioning position for conditioning it to turn on automatically at a preselected future time;

a first voltage source connectable to said voltage-responsive capacitance when said mode switch is in the ON position and adjustable to cause selection by said tuned circuit of a first operating station;

a second adjustable voltage source independent of said first voltage source connectable to said voltage-responsive capacitance when said mode switch is in the conditioning position and adjustable to effect preselection of a second station by said tuned circuit without disturbing operation of the radio on said first operating station;

sleep switch means operable to override said mode switch means and turn the receiver on to receive said first station selected by means of said first adjustable voltage source and to turn said receiver off automatically after passage of a predetermined time interval;

and means including a switch actuated by said clock at said preselected future time for connecting said first voltage source to said voltage-responsive capacitance when said mode switch is in the ON position, and for turning said receiver on and connecting said second voltage source to said capacitance at said preselected time while disconnecting said first voltage source from said capacitance when said mode switch in the conditioning position, thereby automatically tuning said preselected second station at said preselected time while leaving undisturbed

5

6

the adjustment for said first station to allow its immediate restoration without retuning.

2. A clock radio or the like as in claim 1 wherein said first and second adjustable voltage sources each are comprised of a plurality of voltage sources each presettable to furnish a plurality of voltage levels characteristic respectively of a plurality of operating stations and a selector switch means for selecting

one of said plurality of voltage sources for connection to said voltage-responsive capacitance, thereby affording the listener a plurality of presettable station choices both for the selection of said first operating station and for the preselection of said second operating station.

10

15

20

25

30

35

40

45

50

55

60

65

70

75