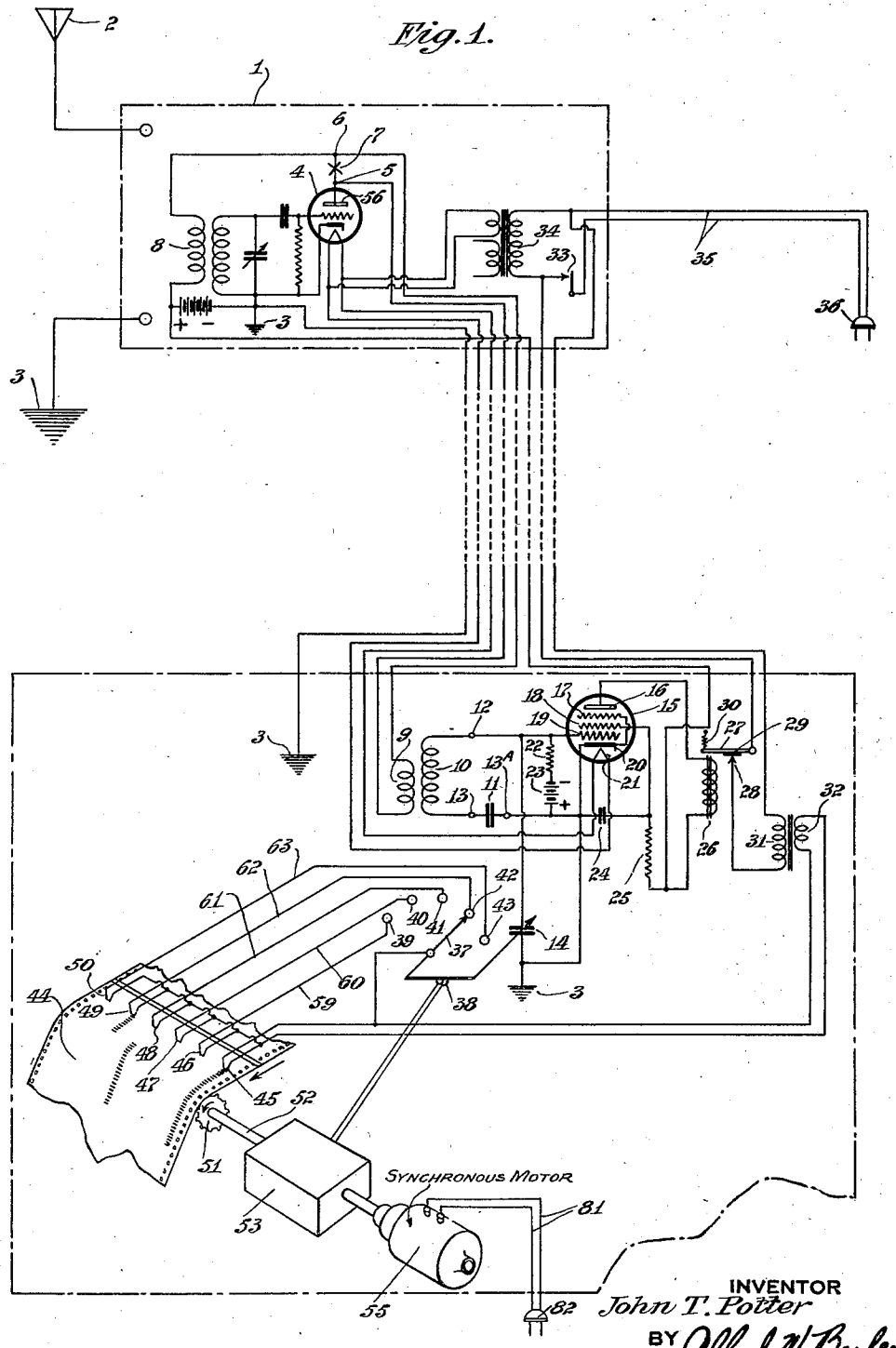
Sept. 3, 1940. J. T. POTTER 2,213,886

RADIO RECORDER

Filed July 8, 1938 2 Sheets-Sheet 1

Fig. 1.



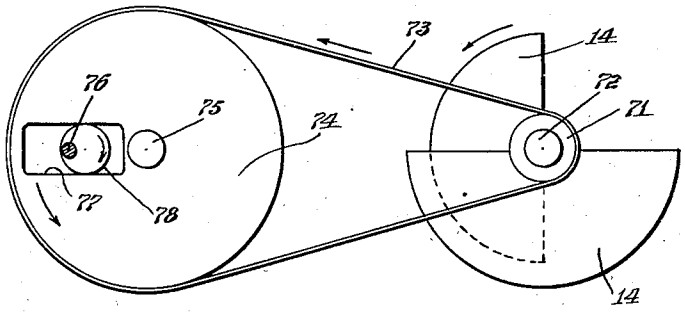
INVENTOR
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RADIO RECORDER

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Fig. 2.



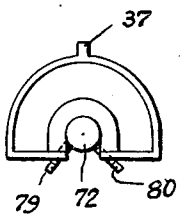
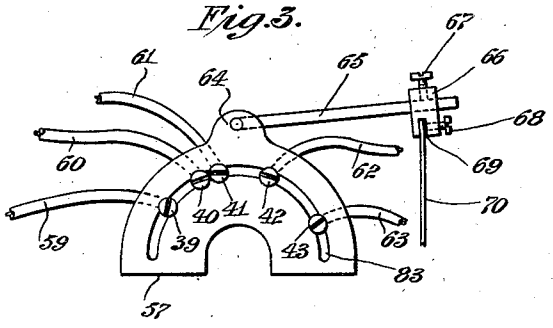


Fig. 4.

Fig. 3.



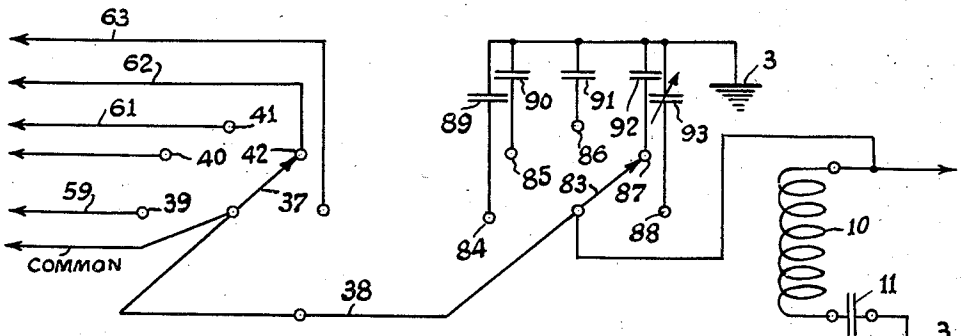


Fig. 5.

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Patented Sept. 3, 1940

2,213,886

UNITED STATES PATENT OFFICE

2,213,886

RADIO RECORDER

John T. Potter, Brooklyn, N. Y.

Application July 8, 1938, Serial No. 218,142

5 Claims. (Cl. 234—1.5)

My present invention relates to methods of and means for making permanent records of the listening habits of radio receiver users.

One object of my present invention is to provide a system for recording the time and wavelength or frequency of operation of a radio receiver of the superheterodyne type without requiring mechanical connections to the radio receiver.

Another object is to provide such a recording device which may be used even with the smallest midget receiver where space limitations prohibit the use of a mechanically coupled recorder.

Still another object is to minimize the apparent and visible changes required in adapting a radio receiver to operate such a recorder.

A further object is to provide a system for recording the time and wavelength of operation of a radio receiver of the superheterodyne type in which the adjustments in the recorder to adapt it to any particular receiver are minimized so that in most cases changing a coil and padding condenser in accordance with the intermediate frequency of the receiver is all that is necessary.

These and other objects of the invention will be apparent from the following description and in particular from the detailed description of the invention as shown in the figures of the drawings.

In the past the time and wavelength of operation of radio receivers have been recorded by mechanical devices. In general these devices comprise pens or other marking means moved across a paper record sheet by a mechanical mechanism connected to the tuning condenser of the radio receiver. In my co-pending application, Serial No. 112,450 entitled "Recording device for radio receivers,"—filed on Nov. 24, 1936, I have shown an improved mechanically coupled but electrically operated recorder in which certain limitations of past recorders have been overcome. In this present system, however, some of the remaining limitations of my mechanically coupled system have been overcome by a purely electrically coupled device. Some of the elements and operations of the above referred to system are retained in my present system but I have discovered means for determining the wavelength setting of the radio receiver by purely electrical means.

My present system consists of a tuned circuit electrically coupled to the oscillator of the superheterodyne receiver upon which records are to be made. This tuned circuit is connected to a thermionic vacuum tube detector which in turn operates a relay when sufficient voltage appears across the tuned circuit. This relay closes a circuit energizing the marking means of the recording system. The tuned circuit consists of a coil, a fixed padding condenser and a continuously variable tuning condenser. The tuning condenser is continuously rotated or oscillated by a synchronous motor which drives the paper tape of the recorder and which may also run a clock. On the tuning condenser shaft is located a contactor which closes the recorder marking circuit in conjunction with contacts located at predetermined points of angular displacement of the condenser rotor. By proper choice of the coil and padding condenser the tuned circuit may be made to resonate with the receiver oscillator at angular positions of the tuning condenser corresponding to predetermined receiver response frequencies for any commonly used intermediate frequency. Thus when the radio receiver is operating at any of the predetermined frequencies, the simultaneous closing of the contactor circuit and the relay, due to recorder circuit resonance with the receiver oscillator, causes a mark to be made on the recorder tape in a column predetermined to be that of the station being received. In most cases the recording system may be adapted to superheterodyne receivers with various intermediate frequencies merely by using the appropriate coil and padding condenser. A marking stylus energized directly from the relay circuit may be used to record, without going through the selector switch, so that periods of operation of the receiver on other than the predetermined wavelengths is indicated.

Fig. 1 shows a circuit diagram of one form of my present invention.

Figs. 2, 3 and 4 show various mechanical details of the present recorder.

Figure 5 shows one form of selector arrangement.

In Fig. 1, I have shown in block diagram a conventional superheterodyne radio receiver 1 with fragments of the receiver circuit necessary to show the method of electrical connection of my present recording system. Receiver 1 may be adapted to pick up signals in any well known manner as by means of antenna 2 and ground 3. Ground designation 3 is also used to indicate common low potential or "ground" points in the receiver and recorder circuits. The recorder utilizes the oscillator frequency of the receiver to indicate the station being received. One method of coupling to the recorder is through a coupling

coil 9 connected in series with plate 56 of oscillator tube 4 as by opening the plate lead at 7 and connecting leads to coil 9 at points 5 and 6. Other methods of coupling are available as for instance, coil 9 may be connected in series with plate 56 by connections made at the remote or "low" end of plate coil 8.

In the recorder the oscillator current flowing in coil 9 induces a voltage in coil 10. Coil 10 is tuned by a synchronous motor driven tuning condenser 14 and is padded by a series condenser 11. Coil 10 and condenser 11 are chosen to track with the oscillator of the receiver so that by changing them to suit the intermediate frequency of the receiver, condenser 14 will cover the various oscillator frequency ranges used to cover a given carrier frequency band as for instance the broadcast band. Condenser 14 is continuously rotated or oscillated by its synchronous motor drive and, if the receiver is operating in the desired band, at some point of rotation the circuit 10—11—14 will resonate to the receiver oscillator frequency and a sharply increased voltage will be impressed on control grid 19 of the detector tube 15. While not limited to such, detector tube 15 is shown as a pentode with heater 21, cathode 20, control grid 19, screen grid 18, suppressor grid 17 and plate 16. Grid bias battery 23 is connected to grid 19 through grid leak 22 although other bias means may be used. The various voltages in the system are adjusted so that when the resonated oscillator voltage is impressed on grid 19 an increased current flows to plate 16 through the winding of relay 26 sufficient to attract the relay armature 27 closing the relay contacts 28 and 29. Contacts 28 and 29 are connected in series with primary 31 of the recorder energizing transformer 31—32, the radio receiver on-off switch 33 and the leads 35 to a source of alternating current power for the receiver. Secondary 32 is connected to energize a recording stylus 45 and switch 37 and one side of styli 46, 47, 48, 49 and 50. Switch contactor 37 is coupled to condenser rotor 14 by a mechanical link 38 and thus contactor 37 closes circuit with the various contacts 39, 40, 41, 42 and 43 at predetermined settings of condenser 14. Contactors 39, 40, 41, 42 and 43 are adjustable and are adjusted so that contactor 37 contacts them at points of rotation corresponding to tuned circuit 10—14 response points corresponding to frequencies of the receiver oscillator in turn corresponding to desired stations tuned in. Contacts 39, 40, 41, 42 and 43 are connected to styli 46, 47, 48, 49 and 50 respectively. Hence with receiver 1 turned on stylus 45 will be energized once upon each excursion of the tuning condenser 14 and if the station tuned in on the receiver is one of the stations to be recorded one of the other styli 46, 47, 48, 49 or 50 will be energized. If the station tuned in on the receiver is not one of the desired stations only stylus 45 will be energized.

In order to produce a record with a time axis, a paper tape 44 or other suitable recording surface is moved with respect to the styli by means of a synchronous motor 55 which also drives by mechanical coupling 53 the link 38 operating switch 37 and condenser 14. The paper tape may be moved for instance by a sprocket 51 on shaft 52 of motor 55. Motor 55 may be energized over wires 81 and plugged into a source of alternating current by means of plug 82.

Thus tape 44 moves at a predetermined rate and a series of marks are produced showing total time of operation of the receiver and another series marks will be produced showing operation of the receiver at any of a number of predetermined frequencies.

Fig. 2 shows one mechanism for oscillating condenser 14. A condenser which is rotatable through 360 degrees may be continuously rotated but a condenser limited to 180 degrees of rotation must be oscillated through this 180 degree range.

Condenser 14 rotated on a shaft 72 which also carries the contact arm 37 of the selector switch is driven by a pulley 71 through a belt 73 from a second pulley 74. Pulley 74 is mounted on a shaft 75 and is made to rock back and forth through a small angle by means of cam 78 operating in the slot 77 in pulley 74. Cam 78 is mounted on shaft 76 which is rotated continuously by means of synchronous motor 55. The small angular displacement of pulley 74 is increased to 180 degrees by utilizing the step-up action of the large pulley 74 driving the smaller pulley 71.

Fig. 3 shows a detail of the selector switch mechanism. Contacts 39, 40, 41, 42 and 43 are adjustable screws movable in the arc shaped slot 83 in order that they may be pre-set for desired stations. Leads 59, 60, 61, 62 and 63 serve to connect contact points 39, 40, 41, 42 and 43 with recorder styli 46, 47, 48, 49 and 50 respectively. In order to prevent body 57 of the contact mechanism from rotating and to permit adjustment of its position relative to the condenser 14 rotor a clamp 66 is provided with a bar 65 fitting in a hole 64 of body 57. Clamp 66 has a slot 69 which fits over a part of the condenser frame or other suitable part of the recorder as shown by 70. Set-screw 68 permits adjustment and fixing of the clamp 66 on frame 70 and set-screw 67 permits adjustment and fixing of clamp 66 on bar 65. Thus body 57 is adjustable over a wide range of positions and may be finally fixed in any desired position.

Fig. 4 shows a detail drawing of contactor 37. It consists of a spring contactor 37 and set-screws 79 and 80 for securing it to condenser shaft 72.

In Fig. 5 is shown another selector arrangement. Two selector switches 37 and 83 are mechanically connected together and motor driven thru link 38 as before. Switch 37 having contacts 39, 40, 41, 42 and 43 is the stylus selector as above. The second switch 83 is provided with the same number of contacts as switch 37 and at corresponding angular positions. Switch 83 contacts 84, 85, 86, 87 and 88 correspond to switch 37 contacts 39, 40, 41, 42 and 43. Between contact 84 and ground 3 is connected a fixed tuning condenser 89 of a value to tune coil 10 padded by condenser 11 to a desired receiver oscillator frequency corresponding to one of the carrier frequencies which it is desired to record. Similarly other desired carriers are provided for by condensers 90, 91, 92 and 93 connected between switch points 85, 86, 87 and 88 respectively and ground 3. The stations to be recorded may be changed by changing one or more of these fixed condensers or they may be made adjustable for rapid changing. Condenser 93 is shown as being variable in case an easily adjustable recording position is desired.

In Fig. 1 stylus transformer 31—32 is shown energized thru the receiver on-off switch 33 as a preferred arrangement. If the heater and or plate voltage for tube 15 is obtained from the receiver circuits transformer 31—32 may be connected to the power line thru relay 27 at all times

since relay 27 will only be energized while the receiver is turned on.

While I have shown and described one embodiment of my invention it is not intended to limit it to the particular arrangement shown but only to arrangements within the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. In a device adapted to record the tuning positions of a superheterodyne radio receiver including an oscillator, the combination of, a thermionic vacuum tube including at least a cathode, a grid and an anode, an inductance periodically tuned over a band of frequencies by a rotatable, motor-driven variable condenser connected between said grid and cathode, means for moving a record sheet at a constant rate to provide a time base, a plurality of recording styli mounted in spaced relation and bearing upon said sheet, a multipoint switch, means for actuating said multipoint switch in synchronism with said condenser, means for energizing said styli from said anode selectively thru said multipoint switch, and an electrical coupling circuit between said radio receiver oscillator and said tuned inductance whereby said vacuum tube energizes said multipoint switch whenever it is tuned by said variable condenser to a frequency corresponding to that of said oscillator.

2. In a device adapted to record the frequency of an alternating current signal, the combination of an inductance periodically tuned to a plurality of frequencies by a rotatable variable condenser, a plurality of styli, a multi-point selector switch, separate electrical circuits connecting said styli with predetermined points of said seleetor switch, a thermionic vacuum tube interposed between said inductance and means for energizing said styli through said multi-point switch, means for moving a record surface at a substantially constant rate past said styli to provide a time base, means for introducing at least a part of said signal into said tuned inductance, and means for operating said selector switch in predetermined relationship with said condenser whereby said vacuum tube energizes said multipoint switch whenever it is tuned by said variable condenser to a frequency corresponding to that of said signal.

3. In a device adapted to record predetermined tuning points of a superheterodyne radio receiver ncluding a variable frequency oscillator, the combination of, a thermionic vacuum tube including at least a cathode, a grid and an anode, an inductance tuned by a rotatable variable condenser connected between said grid and cathode, a plurality of recording styli mounted in spaced relation and bearing upon a record sheet, a multipoint rotatable switch in series with at least a portion of said styli, an electrical coupling circuit between said oscillator and said tuned inductance, means for rotating said condenser and switch and moving the record sheet in predetermined mutual relation and means connected to said anode for energizing said styli through said switch in response to oscillator derived signals on said grid.

4. In a device adapted to record predetermined modes of operation of a superheterodyne radio receiver including a variable frequency oscillator, the combination of, a thermionic vacuum tube including at least a cathode, a grid and an anode, an inductance tunable by a plurality of condensers, connected between said grid and cathode, a multipoint switch for connecting said condensers in parallel with at least a portion of said inductance for tuning said inductance to predetermined oscillator frequencies, a plurality of styli mounted in spaced relation for recording upon a record sheet, a second multipoint switch in series with at least a number of said styli, an electrical coupling circuit between said oscillator and said inductance, means for operating both of said switches and for moving the record sheet in predetermined mutual relation, and means connected to said anode for energizing said styli through said second switch in response to oscillator signals to which said tuned circuit responds.

5. In a device adapted to record the oscillator frequency of a superheterodyne radio receiver, the combination of, a selective search means comprising an inductance tuned by a succession of predetermined capacities to a plurality of predetermined oscillator frequencies, a selector for selecting said capacities, electrical coupling means for connecting between the oscillator of said receiver and said inductance to introduce signals to be recorded into said tuned inductance, a synchronous motor for operating said selector at a predetermined rate, and a recording means for recording the presence of signals on said predetermined frequencies including an electrically operated device for marking on a record surface, a multi-point selector operated in point-by-point synchronism with the first said selector by said motor, and a rectifier responsive to the presence of tuned signals in said inductance for operating said marking device thru said multi-point selector in accordance with said signals.

JOHN T. POTTER.