Oct. 10, 1939. R. F. ELDER ET AL 2,175,937

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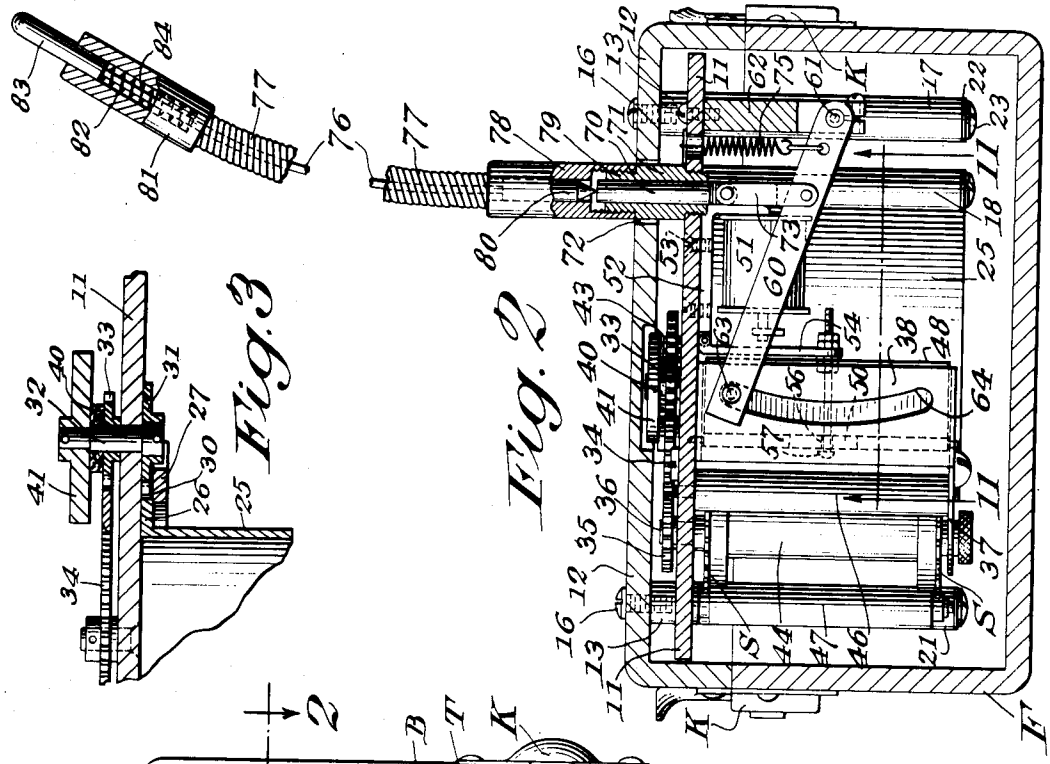


Fig. 3

Fig. 2

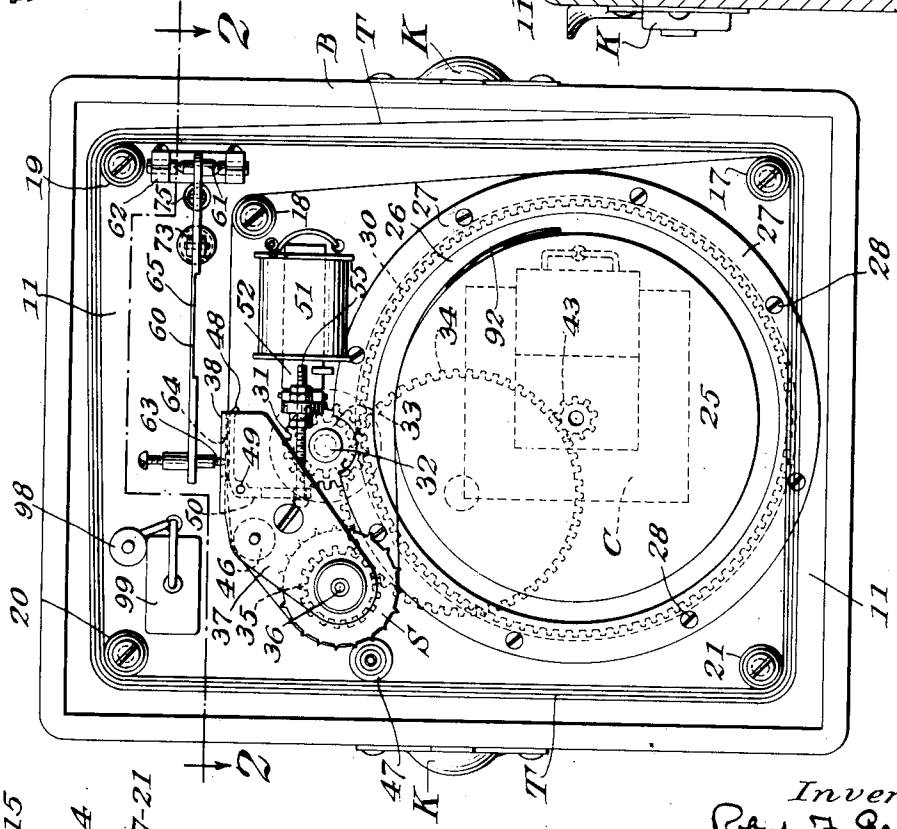


Fig. 1

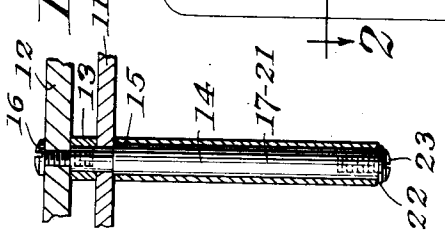


Fig. 4

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Fig. 5

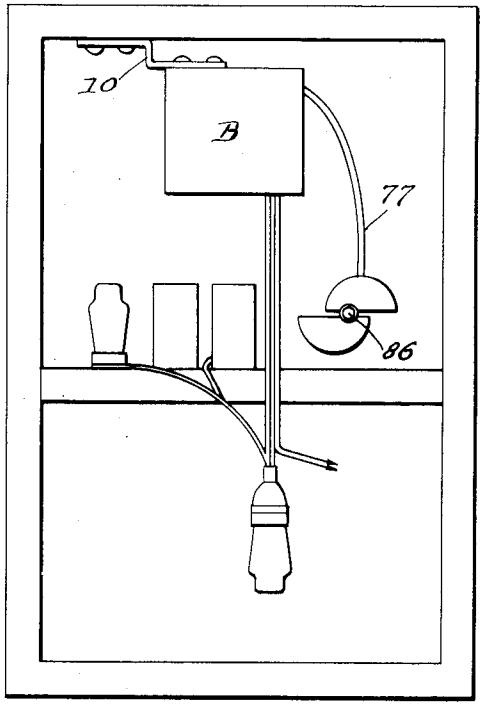
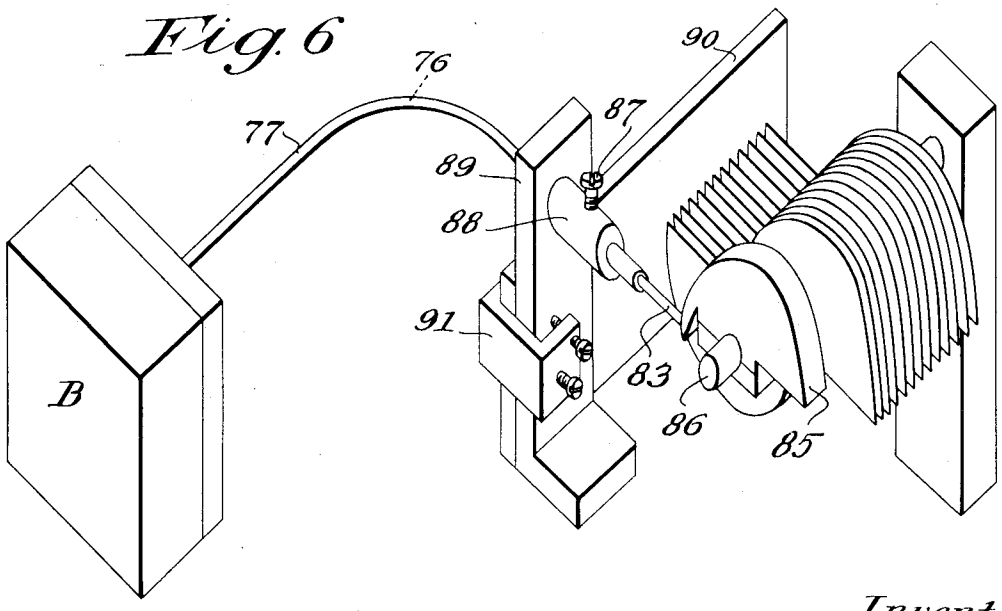


Fig. 6



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Fig. 8

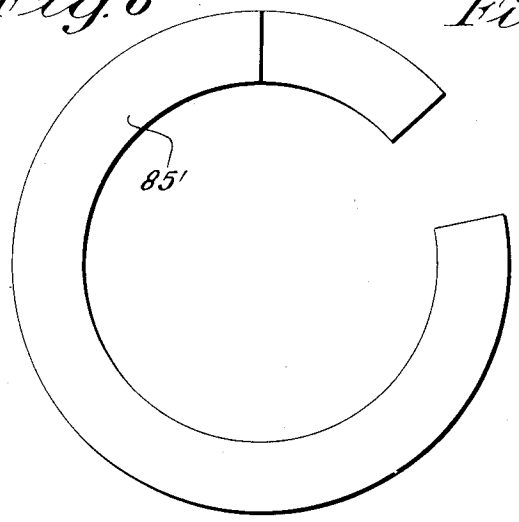


Fig. 9

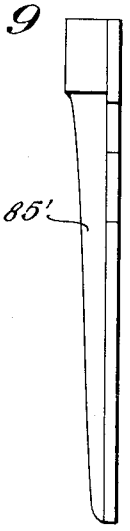


Fig. 7

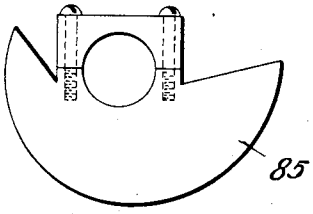


Fig. 10

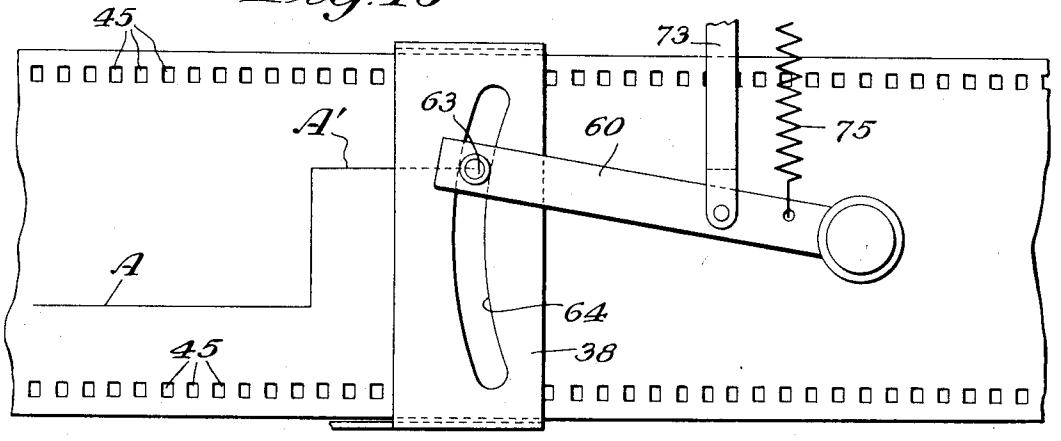


Fig. 12

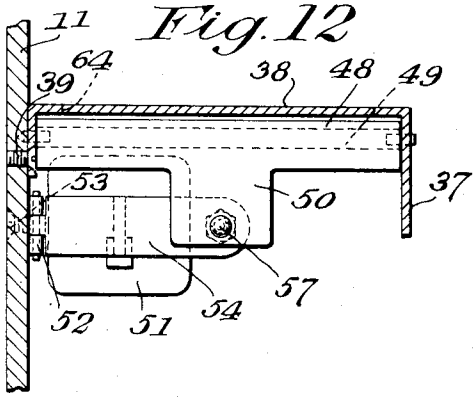
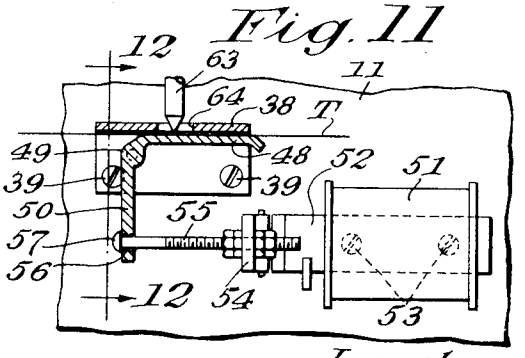


Fig. 11



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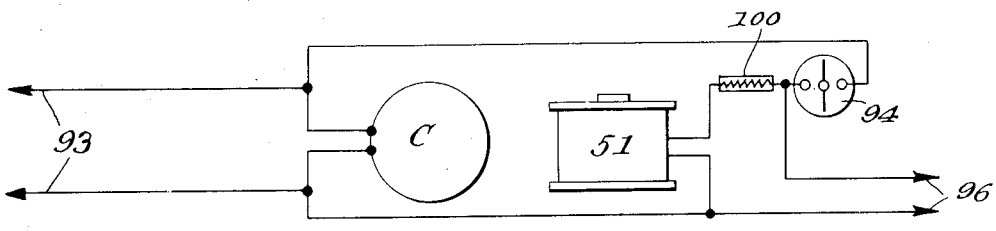


Fig. 13

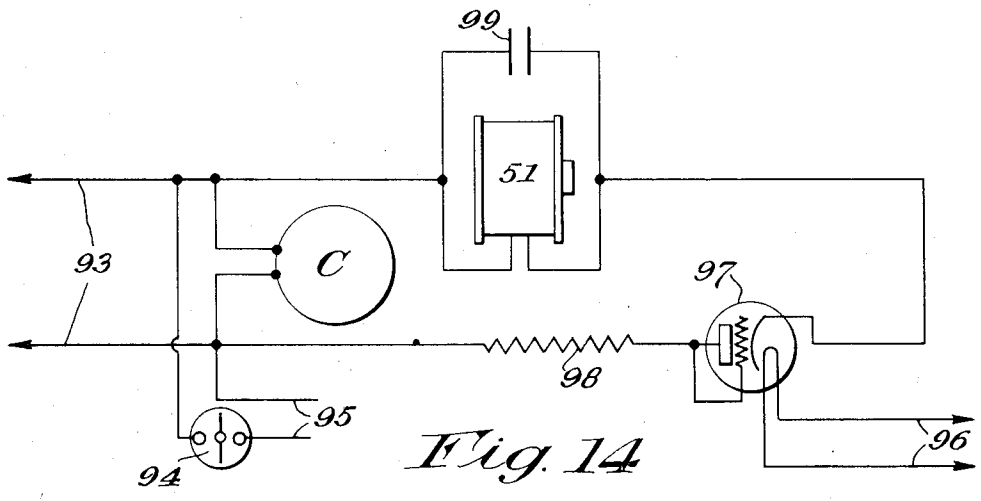


Fig. 14

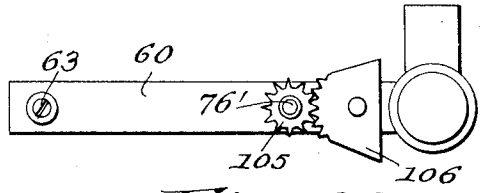


Fig. 16

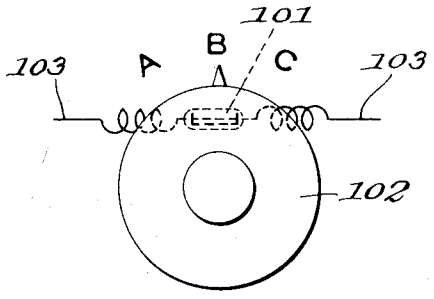


Fig. 15

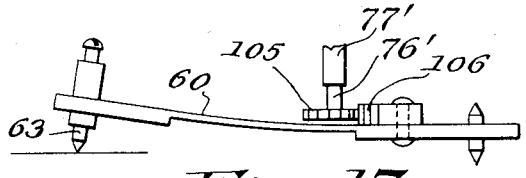


Fig. 17

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UNITED STATES PATENT OFFICE

2,175,937

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Robert F. Elder, Newton, and Louis F. Woodruff, Belmont, Mass., assignors to A. C. Nielsen Company, Chicago, Ill., a corporation of Illinois

Application August 17, 1936, Serial No. 96,350

2 Claims. (Cl. 234—1.5)

This invention relates to devices for making a record of the radio listening habits of users of radio receiving sets and the like.

It is an object of the present invention to provide an inexpensive device of this general character which will operate automatically in response to operation of the receiving instrument and produce an accurate record of the radio transmitting stations to which the receiving set is tuned and of the times of tuning to each station.

Another object of the invention is to provide a device of this character which can be readily attached to the home receiving set while preserving the usual operation and manipulation of the set.

Devices of this general character heretofore have been so designed that their use has been possible only by being built in the radio receiving set by the manufacturer.

A further object of the invention contemplates a device which is so constructed that it may be attached or detached at will to any ordinary receiving set in such manner that the operator of the set may be entirely unaware of the presence of the device thereby making it possible to determine accurately the radio listening habits of many or of all classes and types of radio listeners.

In general, the device of the invention comprises a box which may be temporarily mounted on the inside of the cabinet or at the back of the cabinet of a radio receiving set. This box contains compactly arranged mechanism for moving a record tape at a uniform desired rate at all times. A suitable stylus is also contained in the box so that it is brought into engagement with the record tape when the radio receiving set is being used, the point of contact of the stylus with the record tape being determined by the setting of the tuning mechanism of the radio set. In order to make this possible the invention contemplates a flexible element which is adapted to be operatively connected at one end to the stylus in the box and is adapted to be operatively connected at its other end to the tuning mechanism of the radio receiving set.

The invention will be more clearly understood from the following description in conjunction with the accompanying drawings: in which,

Fig. 1 is a front elevational view of a portion of the device embodying the invention;

Fig. 2 is a sectional view taken upon the line 2—2 of Fig. 1;

Fig. 3 is a detail sectional view of a portion of the structure;

Fig. 4 is another detail sectional view of a portion of the structure;

Fig. 5 is a diagrammatic view of the back of the cabinet of a radio receiving set to which the device of the invention is connected;

Fig. 6 is a perspective view showing the operative connection between the device of the invention and the tuning condenser shaft of a radio receiving set;

Fig. 7 is a detail elevational view of a part of the device;

Figs. 8 and 9 are detail front and side elevational views respectively, of a modified form of the parts shown in Fig. 7;

Fig. 10 is a detail plan view of a portion of the device;

Fig. 11 is a detail sectional view taken substantially upon the line 11—11 of Fig. 2.

Fig. 12 is a sectional view taken substantially upon the line 12—12 of Fig. 11.

Figs. 13 and 14 are circuit diagrams showing the electric layout of the device for alternating and direct current respectively;

Fig. 15 is a detail front elevational view of a band selection switch of a multi-band radio receiving set embodying a short wave cut-out switch; and

Figs. 16 and 17 are detail plan and front elevational views of a modified form of parts of the device.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention claimed herein beyond the requirements of the prior art.

The embodiment of the invention illustrated in the accompanying drawings comprises a box B in which are compactly housed most of the instrumentalities of the device and which may be readily temporarily attached in desired relation to any ordinary radio receiving set as by a bracket 10 (Fig. 5). The box B is provided with a removable front cover F secured thereto by fasteners K. A partition 11 is spaced from the back wall 12 of the box B by suitable spacers 13 and is held in such position by a plurality of rods 14

passing through the partition 11 and spacers 13. Each of the rods 14 is secured to the back wall 12 by screws 16 and has a shoulder 15 abutting the partition 11. Rolls 17, 18, 19, 20 and 21 are carried upon the rods 14 adjacent the front face of the partition 11 and are held thereon by washers 22 and screws 23.

A hollow drum 25 having an outwardly turned flange 26 is held for rotation, with the flange 26 slidably engaging the front face of the partition 11, by a plate 27 overlapping the flange 26 and secured to the partition 11 by screws 28. The flange 26 is provided with teeth 30 adapted to mesh with a gear 31 carried by a shaft 32 mounted for rotation in the partition 11 above the drum 25. A gear 33 loosely mounted upon the shaft 32 between the partition 11 and the back wall 12 is adapted to engage an idler gear 34 which in turn meshes with a gear 35 fixed upon a shaft 36 which is mounted for rotation near one end in the partition 11 and near its other end in an ear 37 depending from the front edge of the platform 38 which is suitably secured to the partition 11 by screws 39. A friction clutch 40 is disposed between the gear 33 and a disc 41 fixed upon the shaft 32. A suitable driving mechanism, such as an electric clock motor C, is suitably secured upon the partition 11 within the drum 25 and is adapted to rotate a pinion 43 meshing with the idler gear 34.

A record tape driving pulley 44 is fixed upon the shaft 36 upon the front side of the partition 11 and is provided at each end with a sprocket S adapted to engage the perforations 45 adjacent each side of a record tape T (Fig. 10). A roll 46 is positioned just below one end of the platform 38 and is rotatably mounted upon a rod extending between the partition 11 and the ear 37. A roll 47 is mounted upon a rod extending from the front face of the partition 11 and is positioned to project into the space between the sprockets S.

An arm 60 is provided at one end with cone bearings 61 adapted to engage suitable bearing sockets in a bracket 62 carried by the partition 11. A stylus 63 is adjustably carried at the other end of the arm 60 and is adapted to project through an opening 64 in the platform 38. The arm 60, preferably, is resilient so that the stylus 63 will be urged through the opening 64 with a slight resilient pressure. For this purpose the arm 60 may be provided with an intermediate section 65 of leaf spring steel.

A movable platform 48 is pivotally mounted upon a rod 49 extending beneath the stationary platform 38 between the partition 11 and the ear 37. An arm 50 extends downwardly from the pivoted end of the platform 48. An electro-magnet 51 is carried by a bracket 52 secured to the partition 11 by screws 53. An armature 54 is pivoted at one end to the bracket 52 and adjustably carries at its other end a rod 55 which extends through an opening 56 in the arm 50. The rod 55 is provided with an enlarged end 57 adapted to engage the arm 50 whereby the platform 48 is moved into engagement with the stylus 63 when the magnet 51 is energized.

A slide or plunger 70 is slidably mounted in a bushing 71 secured in a threaded opening in the partition 11 and extending through an opening 72 in the back wall 12 of the box B. One end of a link 73 is pivotally connected to the inner end of the plunger 70 and the other end of the link 73 is pivotally connected to the arm 60. The plunger 70 is urged outwardly by a spring 75 anchored at one end to the partition 11 and secured at its other end to the arm 60. A Bowden wire 76 is slidably mounted within a flexible armor 77 which may contain a suitable lubricant such as a graphite grease mixture to permit free movement of the Bowden wire therein. The flexible armor 77 is provided at one end with a fitting 78 having a threaded socket adapted to engage the threaded end 79 of the bushing 71 which projects through the back wall 12 so as to permit engagement between the enlarged end 80 of the Bowden wire with the outer end of the plunger 70. The other end of the armor 77 is provided with a fitting 81 having a cavity 82 adapted to slidably receive the enlarged end 83 of the Bowden wire 76. The enlarged end 83 is urged outwardly by a spring 84 surrounding the Bowden wire 76 and interposed between the bottom of the cavity 82 and the inner end of the enlargement 83.

A split radial cam 85 (Figs. 5, 6 and 7) is clamped to the tuning shaft 86 of the tuning condenser of any ordinary radio receiving set and is adapted to be engaged by the enlarged end 83 of the Bowden wire 76. For this purpose the flexible armor 77 may be held near its outer end by a set screw 87 in a sleeve 88 carried by a bracket 89 which may be secured to any convenient stationary part 90 of a radio receiving set by a clamp 91. The spring 84 tends to hold the enlarged end 83 of the Bowden wire in engagement with the cam 85 and the spring 75 tends to hold the plunger 70 in engagement with the enlarged end 80 of the Bowden wire whereby movement of the Bowden wire, which is caused by a change in the position of the cam 85, is transmitted to the arm 60.

The record tape T is positioned in convolutions extending over the rolls 17, 19, 20 and 21. From the inner convolution the tape extends over the roll 18 and between the platforms 38 and 48 and over the roll 46, thence over the drive pulley 44 and between the same and the roll 47 to the drum 25 where its end is secured to the clamp 92. The drum 25 is positively driven through the friction clutch 40 and serves as a take-up roll for the record tape T.

The preferred electric circuit for use with the device is shown diagrammatically in Fig. 14. Alternating current is supplied from a suitable source by the leads 93 to the main switch 94 of the radio receiving set. The leads 95 carry the electric current from the switch 94 to the operating instrumentalities of the radio receiving set. The leads 96 connect the low tension winding of the filament transformer of the radio receiving set with the filament of the rectifier tube 97 of the receiving set and supply power to heat the filament of the rectifier tube when the main switch 94 is turned on. The rectifier current flows through the magnet 51 and the protective resistance 98 (preferably about 500 ohms). A smoothing condenser 99 (preferably about 10 micro-farads) is provided to decrease the ripple in the rectified current so as to eliminate any tendency on the part of the magnet 51 to chatter. The electric clock motor C is permanently connected across the leads 93 so that it will run at all times whether the radio receiving set is turned on or off. When the power supply for the radio receiving set is direct current a mechanical clock motor with a spring drive may be used instead of the electrically actuated clock C.

Another circuit which may be used with the magnet 51 to operate on alternating current is shown in Fig. 13. In this circuit, the closing of the main switch 94 throws the regular 110 volt

alternating current across the winding of the magnet 51. A shading coil 100 is provided to reduce the chatter and noise in the magnet.

Many radio receiving sets are designed to receive on several bands of frequency using the same condenser assembly for tuning on all bands. In such case, a cut-out switch 101 is suitably mounted on the back of the band selector 102 (Fig. 15), preferably, in the form of a mercury capsule switch with flexible leads 103 so placed as to be closed when the set is tuned to the regular broadcast band and to be opened when the set is turned to one of the other band ranges.

The device of the invention is adapted to be installed temporarily in or in desired relation to any ordinary radio receiving set and when so installed, as previously described, the motor C operates continuously to move the record tape T at a uniform desired speed over the movable platform 48 and under the stylus 63. When the main switch of the radio receiving set is turned on, current is supplied to the magnet 51 to actuate the armature 54 and cause the latter to pivot and thus raise the platform 48 and bring the record tape T into engagement with the stylus 63. The position of the stylus relative to the longitudinal edges of the record tape will depend upon the setting of the tuning mechanism of the radio receiving set and will vary depending upon the broadcasting station being received. Thus, the position of the stylus relative to the edges of the record tape when one station is being received may be indicated by the line A (Fig. 10). If the setting of the tuning mechanism of the radio receiving set is changed, the position of the cam 85 will be changed and will cause the Bowden wire 76 to move the arm 60 and cause the stylus 63 to move transversely of the record tape to a new position as indicated by the line A' (Fig. 10). If desired, the record tape may be provided with graduations representative of the day and the time thereof so that the exact time and the duration of the tuning of the receiving set to a particular station may be readily ascertained. However, the provision of such graduations upon the record tape is expensive and is unnecessary inasmuch as the reading of the tape and the interpretation of the stylus markings thereon may be readily made by the use of a device described in the patent to Louis F. Woodruff, 2,092,544 of September 7, 1937.

A modified form of cam 85' of the axial type may be used in place of the cam 85. Thus, the cam 85' may be glued or otherwise secured to a flat plate which is attached to the condenser shaft in some radio receiving sets.

A modified form of mechanism, such as that shown in Figs. 16 and 17, may be employed in place of the Bowden wire 76 for providing the operative connections between the tuning mechanism of the radio receiving set and the stylus arm of the device of the invention. The modified mechanism shown in Figs. 16 and 17 comprises a flexible torsional shaft 76' enclosed in a flexible armor 77'. The shaft 76' is provided with a pinion 105 adapted to mesh with a segmental gear 106 fixed to the arm 60. Preferably, the gear 106 is concentric with the axis of rotation of the arm 60. The other end of the shaft 76' is fixed to the tuning condenser shaft of the radio receiving set so that a change in the setting of the tuning condenser will result in a corresponding change in the position of the stylus 63.

We claim:

1. In a device for recording the use of a radio receiving instrument, said device having a movable stylus and record sheet outside of said instrument, the combination therewith of electrically actuated means responsive to actuation of the main switch of said instrument for relatively moving said record sheet and stylus into and out of a given plane, said electrically actuated means including a switch actuated by the band frequency selector of said instrument to open when said instrument is used outside a predetermined band frequency range.

2. In a device for recording use of a radio receiving instrument having a tuning element incorporated therein, a movable stylus and record sheet, flexible means for moving said stylus in a plane parallel to the plane of said record sheet, said moving means being actuated by a member mounted for movement in accordance with the movements of said tuning element within said receiving instrument, and means for moving said record sheet into the plane of movement of said stylus, said last-mentioned moving means comprising means so connected to the power supply switch for said receiving instrument that upon closing said power supply switch said means will be energized.

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