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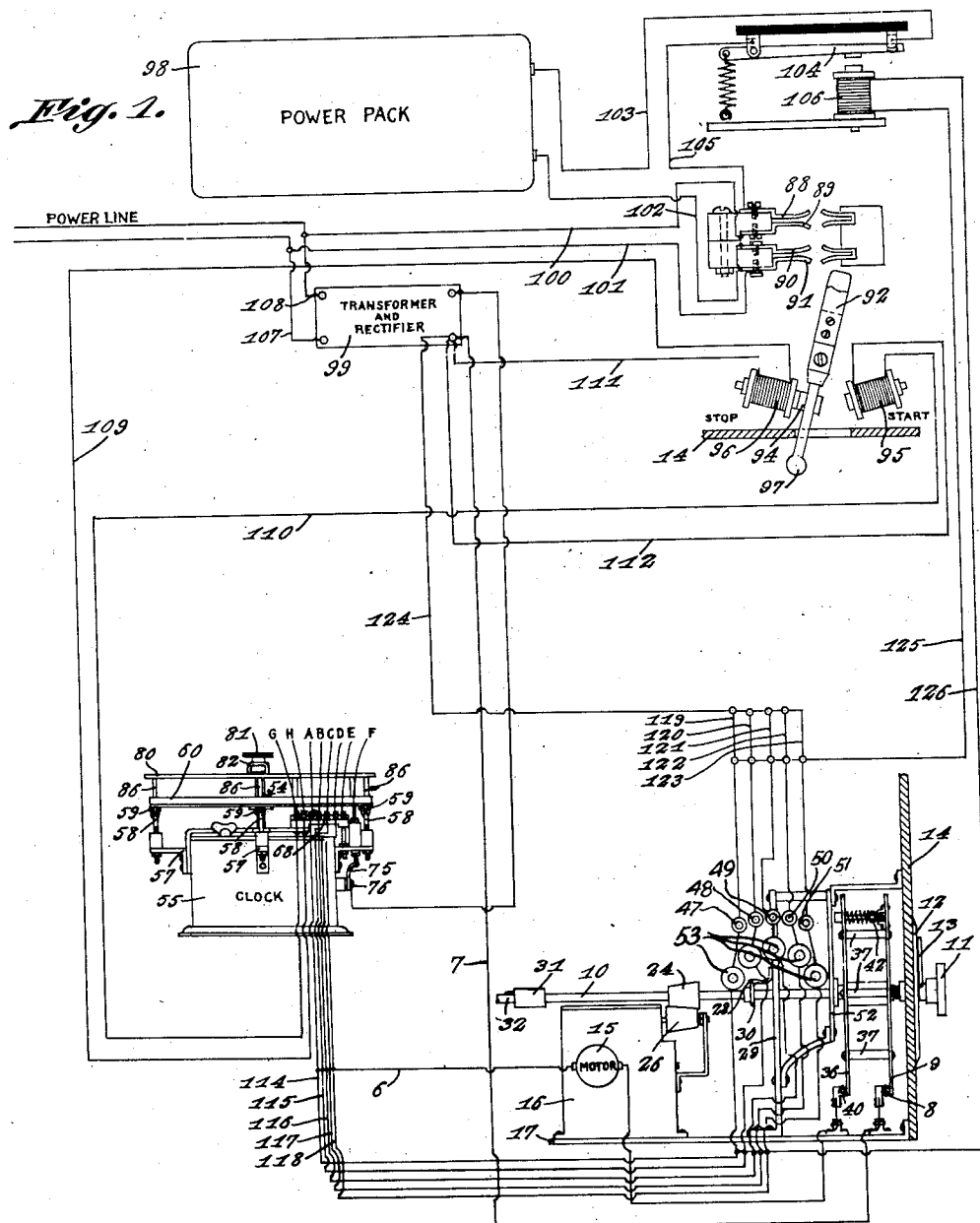
F. W. KIENA

2,097,330

AUTOMATIC STATION SELECTOR AND TUNING DEVICE

Filed May 25, 1936

4 Sheets-Sheet 1



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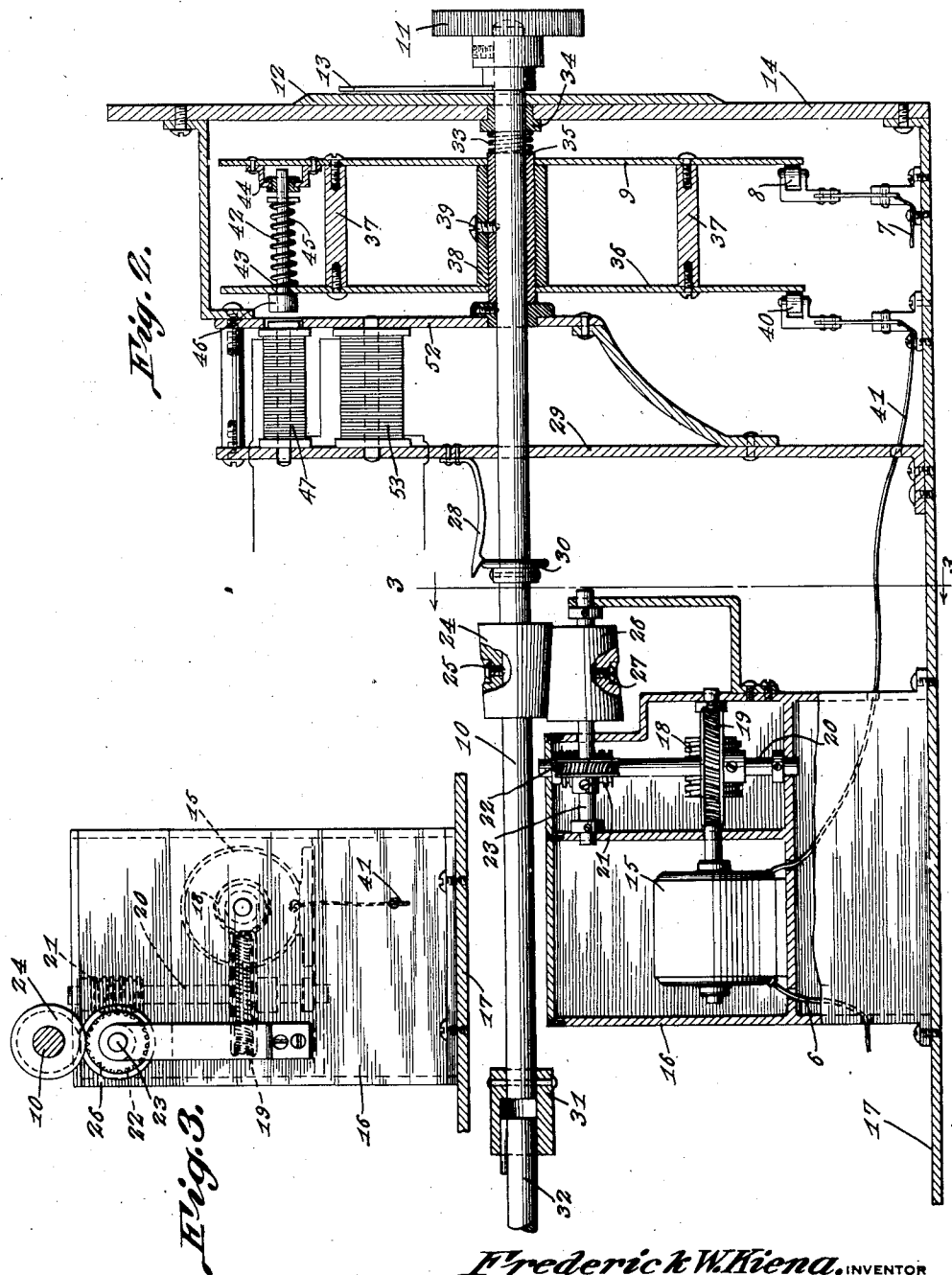
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4 Sheets-Sheet 2



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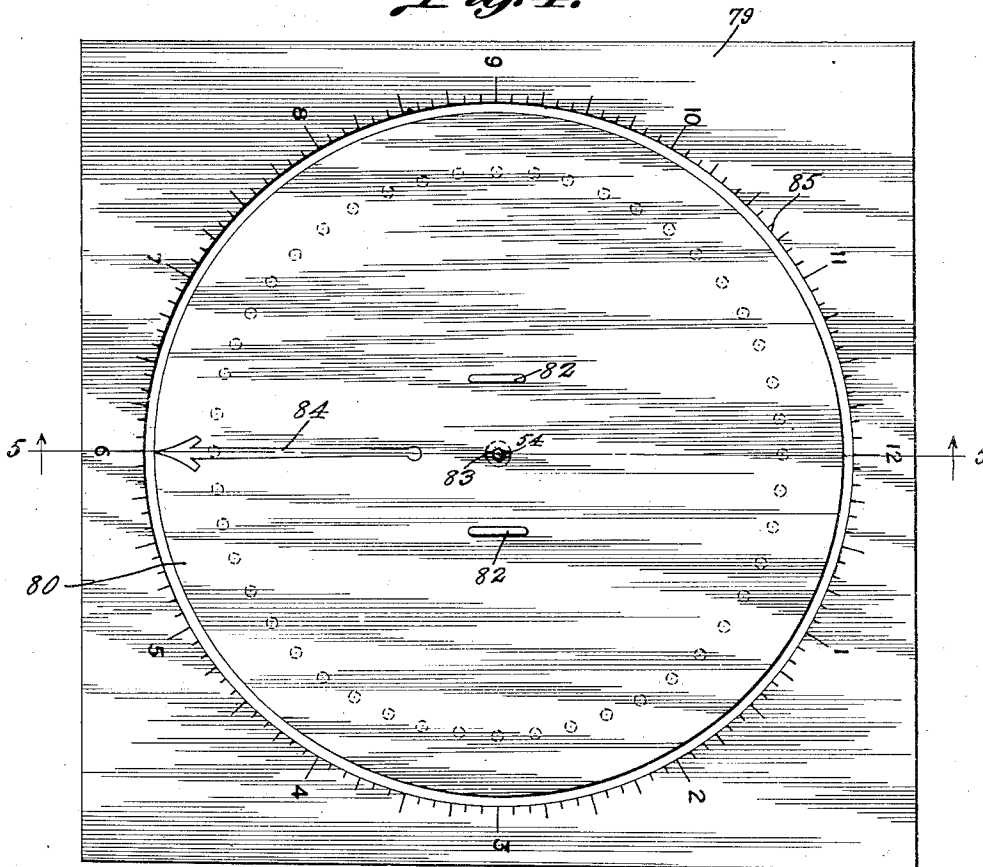
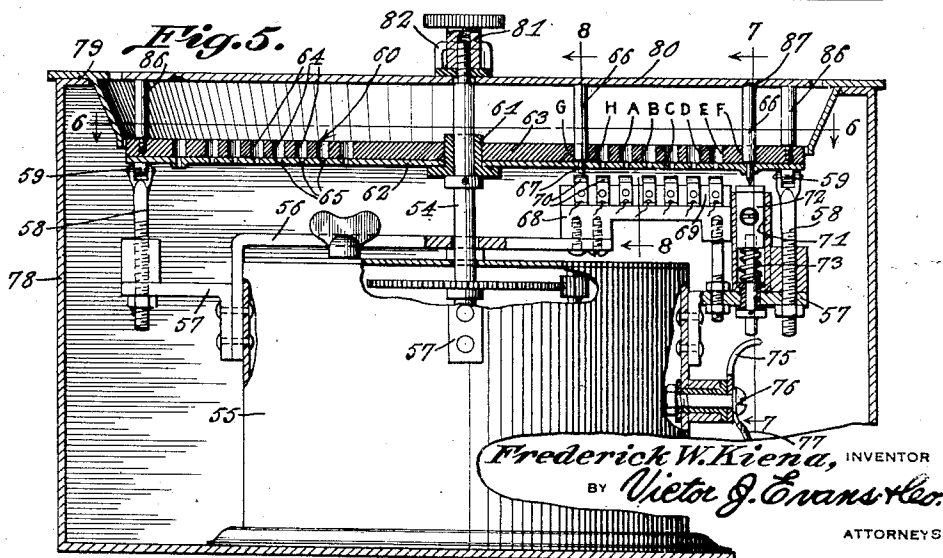
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Fig. 4.



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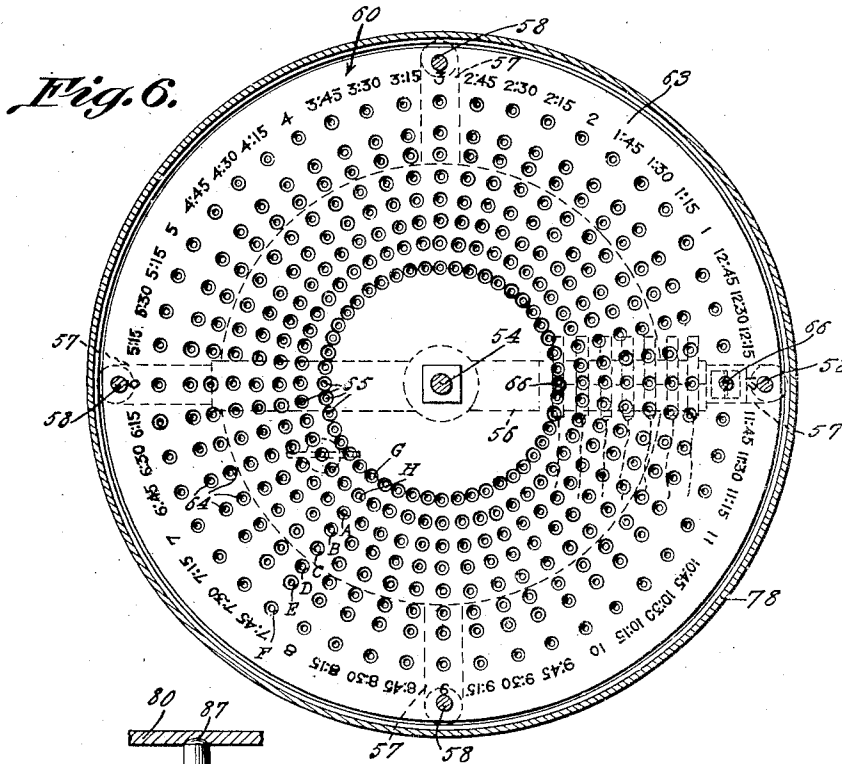
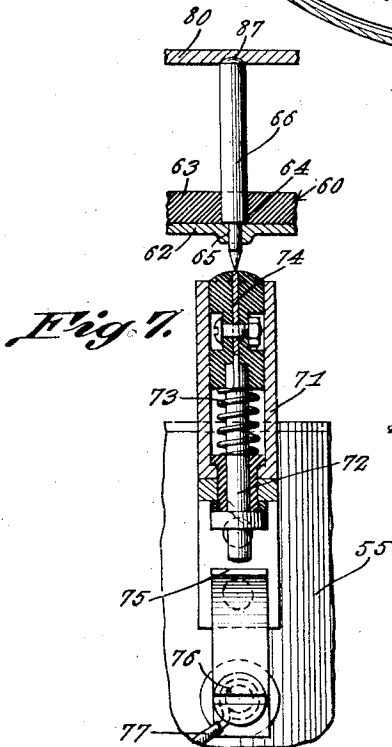
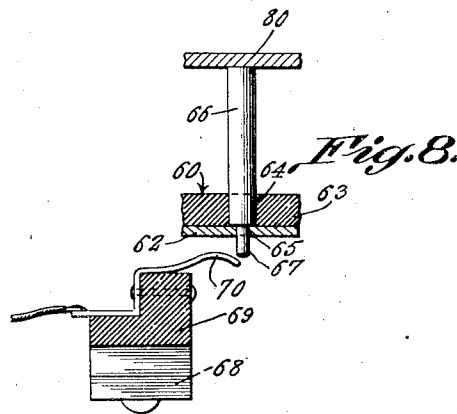
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AUTOMATIC STATION SELECTOR AND TUNING DEVICE

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,097,330

AUTOMATIC STATION SELECTOR AND
TUNING DEVICE

Frederick W. Klena, West Brighton, N. Y.

Application May 25, 1936, Serial No. 81,746

4 Claims. (Cl. 250—20)

This invention relates to radio receiving instruments and more particularly to new and useful improvements in automatic station selector and tuning devices therefor.

5 An object of the invention is to provide a simplified and positive means whereby the owner of a radio receiving instrument may select from public programs those in which he is most interested and set the instrument according to the
10 times during which the programs are to be given, so that at the commencement of such times, the selected stations are automatically tuned in without attention on the part of the owner.

A further object is to provide an automatic
15 station selector and tuning device which will interfere in no way with the ordinary tuning of the receiving instrument by hand so that any station within the range of the instrument may be tuned in independent of the attachment.

20 With the above and other objects in view the invention consists of certain novel details of construction and combinations of parts hereinafter fully described and claimed, it being understood that various modifications may be resorted to
25 within the scope of the appended claims without departing from the spirit or sacrificing any of the advantages of the invention.

An embodiment of the invention is illustrated in the accompanying drawings forming part of
30 this specification, in the several views of which like parts are designated by similar reference characters, and in which

Figure 1 is a diagrammatic view of the apparatus and circuits in the system comprising the
35 invention.

Figure 2 is an enlarged partly sectional and partly broken elevation of the motor which functions to turn the tuning condenser shaft of the
40 receiving instrument, and showing the control means therefor, as well as showing also the means for manually tuning the instrument.

Figure 3 is a cross sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a plan view of the clock dial.

45 Figure 5 is a cross sectional view taken on the line 5—5 of Figure 4 and showing the clock operated station selector disc and circuit closers associated therewith.

Figure 6 is a cross sectional view taken on the
50 line 6—6 of Figure 5 and showing the station selector disc in plan.

Figure 7 is an enlarged detail cross sectional view taken on the line 7—7 of Figure 5.

55 Figure 8 is an enlarged detail cross sectional view taken on the line 8—8 of Figure 5.

Referring now to the drawings in which like characters of reference designate similar parts in the various views, 10 designates the condenser tuning shaft of a radio receiving set, having at
60 one end a knob 11 for manual rotation of the

shaft. A dial 12 and pointer 13 of conventional type are disposed outside of the instrument panel 14 for manually tuning the condenser in the usual manner.

An electric motor 15 is mounted in a sound-
proof housing 16 at any convenient location in the radio receiving instrument 17 and is adapted to rotate the condenser tuning shaft 10 through the instrumentality of a slow motion transmission mechanism including a worm pinion 18 on
10 the motor shaft, a worm gear 19 on a stand shaft 20, which latter is equipped with a worm pinion 21 that meshes with a worm 22 that is fixed to a shaft 23. A conical friction pulley 24 is fixed to the condenser tuning shaft by means of a screw
15 25 and a similar friction pulley 26 is fixed to the motor driven shaft 23 by means of a screw 27.

The motor may be disconnected from the shaft
10 by pulling outward upon the knob 11 to disengage the friction clutch pulleys 24 and 26. The
20 shaft may be locked in this outward position for hand tuning the instrument by a spring dog 28 which is secured at one end to the rear side of an insulated standard 29 and which engages
25 over a collar 30 on the shaft 10 to yieldably latch the shaft in its outward position. The shaft 10 is equipped with an integral sleeve 31 which is splined to the condenser shaft 32 so that the tuning of the instrument may be effected when the
30 shaft 10 is either hand rotated in its outer position or motor rotated in its inner position. A helical spring 33 surrounds the tuning shaft 10 and is confined under tension between collars 34
35 and 35 on the tuning shaft to hold the clutch pulleys 24 and 26 in tight frictional engagement with each other when the tuning shaft is at its inner limit of sliding movement.

Figure 2 also illustrates a switch device for controlling the motor circuit, the same including
40 parallel metal discs 36 and 37 which are connected together preferably by four insulated spacers 38. The discs are fixed to an insulated hub 39 which is secured to the tuning shaft 10 by a screw 39
45 so that the switch device rotates as a unit with the tuning shaft. A pair of conductor rollers 40 and 41 which ride upon the faces of their associated discs 36 and 37, and form terminals for circuit wires 42, 43 and 44, will be later referred to
50 in detail.

A conductor pin 42 is slidably fitted at one end
50 in an opening 43 in the disc 36 and is slidable in and insulated from a U-shaped bracket 44 on the disc 37. A spring 45 normally holds the pin in engagement with the disc 37 so that the discs
55 36 and 37 are electrically connected together. An armature 46 is fixed to the free end of the pin.

A plurality of electro-magnets 47 to 51 inclusive, preferably five in number corresponding to five different radio broadcasting stations, 60

which the present embodiment of the invention is designed to tune in, are arranged on the insulated standard 29 circumferentially about a center in the axis of the tuning shaft 10. The cores of these electro-magnets project through respective openings in an insulated plate 52 carried by and disposed parallel with the standard 29. When a particular one of these electro-magnets is energized its core attracts the armature 46 during rotation of the discs 36 and 9 to disengage the conductor pin 42 from the disc 9 and break the motor circuit at this point to stop the motor. Each electro-magnet coil is provided with an associated coil 53 the winding of which is in series with the winding of the electro-magnet coil to prevent heating of the electro-magnet coil.

The time controlled station selector is in the nature of a remote control instrument best shown in Figures 4 to 8, inclusive. The clock work mechanism may be of the electric type or of the hand wound type and for the purpose of clarity and briefness only the hour hand arbor 54 is illustrated, the same rising through the top of the clock casing 55. The clock casing is equipped with a bracket 56 which overhangs the top of the casing and is also equipped with four brackets 57 which are secured to the cylindrical wall of the casing. The brackets 57 are equipped with screw posts 58, as shown in Figure 6, and these posts are equipped with insulated rollers 59 which form bearings that support the station selector disc designated in general by the numeral 60. The disc is keyed to, and insulated from the arbor 54 by a bushing 61 having a key way to receive a key on the arbor as shown in Figure 5. Thus the disc is rotated as a unit with the hand arbor, making one complete revolution in twelve hours.

The station selector disc comprises a metallic base plate 62 and a face plate 63 of insulating material, as best shown in Figure 5. Circular series of openings 64 are formed in the face plate and register with corresponding circular series of openings 65 formed in the base plate, the former openings being substantially greater in diameter than the latter openings in order to receive circuit closing pins, one of which is shown at 66 in Figure 8. The body of the pin is receivable in the opening in the face plate, and is supported upon the base plate. A reduced axial extension 67 on the pin is received in the opening in the base plate and projects laterally below the base plate.

Certain of the circular series of openings correspond to respective broadcasting stations desired to be heard, as for example, by referring to Figure 6 it will be seen that five broadcasting stations A, B, C, D, and E, are indicated and are represented by a band of the circles included between the outermost series of circles F, and the two innermost series of circles G and H. The radial lines of openings 64 are spaced apart at intervals of fifteen minutes throughout the twelve hours and numerals indicating the hour periods are inscribed on the face plate near the edge thereof, as best shown in Figure 6, the numerals progressively increasing from 1 to 12 in a direction counter-clockwise of the dial.

By referring to Figure 5 it will be seen that an inverted U-shaped bar 68 is secured to the end of the bracket 56 and extends radially below the station selector disc. As shown in Figure 8, the bar is provided on the top face with a strip 69 of insulation. A plurality of spring circuit closers

70 are fixed to the insulating strip and are equal in number to, and are adapted to underlie seven of the openings 64 beginning at the innermost circular series designated G and ending at the next to the outermost circular series designated E. These circuit closers, when pins are plugged into said openings, intercept the pins and close circuits to tune in selected broadcasting stations at predetermined times.

Fixed to the bracket 57, and underlying the station selector disc underneath the outermost circular series of openings designated F there is a circuit closer, best shown in Figure 7, and comprising a housing 71 having a plunger 72 therein. The plunger is insulated from the housing and is normally held at its upper limit of movement by a spring 73. The plunger is provided with a central metallic core 74 which is adapted to be engaged by the pin 66 inserted in one of the openings of the outermost circular series designated F, as best shown in Figure 5, whereupon the plunger is depressed to close a circuit for supplying current to the metallic base plate 62, pins 66 plugged therein and circuit closers 70.

Underneath the plunger a resilient arcuate switch contact 75 is fixed to and insulated from the clock casing 55 by means of a screw 76 to which is connected a circuit wire 77 for supplying current to the metallic core 74 of the plunger 72.

As best shown in Figures 4 and 5 the mechanism above described is enclosed in a casing 78 having an annular flange 79 on the top to provide a clock dial, the same having inscribed thereon division marks indicating twelve hours, these divisions being sub-divided to indicate five minute periods of each hour. A cover plate 80 of circular contour is fitted within the circular orifice in the flange 79 and is mounted to rotate as a unit with the station selector disc 60 by means of a screw pin 81 threaded into the upper end of the clock arbor 54. By unscrewing the pin the cover plate may be removed to arrange the pins 66 in a pattern to tune in selected broadcasting stations as will presently be described. A pair of handles 82 are arranged on opposite sides of the screw pin to facilitate removing and replacing the cover plate.

The cover plate is provided with an arrow 84 which simulates a clock hand and may be inscribed, painted, or otherwise applied to the cover plate so that the time may be easily read because the radial division marks denote five minute intervals of the hour periods and by glancing at the hand and the division mark aligned therewith the number of minutes after or before the hour may be readily determined. The numerals of the clock dial 85 are arranged clockwise as is usual. The station selector disc is provided with upstanding pins 86, preferably four in number, which support the cover plate near its peripheral edge, as best shown in Figure 5. The underneath face of the cover plate is provided with a circular series of sockets 87 which are arranged at fifteen minute intervals apart to receive the pointed pin 66 which supplies current to the metallic base plate 62 of the station selector disc, as indicated at F in Figure 5.

As shown in Figure 4, the six o'clock and 12 o'clock markings on the dial, the key way in the bushing 61, and a pair of diametrically opposite sockets 87 will always be in alignment when the cover plate is replaced thus assuring proper registration of the sockets with the current supply pin

receiving openings F in the station selector disc shown in Figure 6.

The controlling switch for supplying current from the service line to the receiving instrument and to the station selector and tuning apparatus, is best shown in Figure 1, to include spring jaws 88 and 89 and spring jaws 90 and 91. The pivoted switch blade 92 is provided with armatures 93 and 94 which confront the cores of respective electro-magnets 95 and 96. The blade may be automatically moved to open and close the switch by means of the magnets, or, by means of the grip 97 may be manually operated when the receiving set is to be tuned manually.

The electrical connections of the apparatus are best shown in Figure 1 in which 98 designates the power pack of the receiving instrument and 99 designates the transformer and rectifier, these being conventional parts common to radio receiving instruments.

Conductor wires 100 and 101 connect the power line respectively to the switch jaw 89 and switch jaw 91. A conductor wire 102 connects the switch jaw 90 to one terminal of the power pack. A conductor wire 103 connects the other terminal of the power pack to one contact of a relay 104, the other contact of which is connected by a conductor wire 105 to the switch jaw 88. Thus when the knife switch is closed by the starting magnet 95, or by hand, current is supplied to the power pack to start the receiving instrument, assuming that the magnet of the relay 104 is de-energized. When the relay magnet 106 is energized the circuit to the power pack is broken to stop the instrument.

Conductor wires 107 and 108 connect the power line to the transformer and rectifier which latter supply proper current and voltage to the automatic tuning device.

A conductor wire 109 connects one terminal of the stopping magnet 96 with one of the switch contacts 70 in the station selector device, designated H. A conductor wire 110 connects one terminal of the starting magnet 95 with the switch contact 60 designated by the letter G. Conductor wires 111 and 112 connect the remaining poles respectively of the stopping and starting magnets to one terminal of the transformer and rectifier 99.

The other terminal of the transformer and rectifier 99 is connected by a conductor wire 77 to the switch contact 75 through which current is supplied to the base plate of the station selector disc 60 when the plunger 72 is in circuit closing position in contact with one of the pins 66 disposed in an opening 64 of the outermost circular series, designated by the letter F.

Five conductor wires 114 to 118 inclusive are connected to the five switch contacts 70 designated by the letters A, B, C, D, and E, which correspond to the selected list of broadcasting stations to be received, and these circuit wires are connected to the leading ends of the windings of corresponding ones of the electro-magnets 47 to 51 inclusive, heretofore described as breaking the motor circuit by moving the conductor pin 42 from engagement with the disc 9. Conductor wires 119 to 123 inclusive are connected respectively to the final ends of the windings of the electro-magnets 47 to 51 inclusive and are connected to a common conductor wire 124 which is connected to one pole of the transformer and rectifier as shown. A conductor wire 125 is connected across all of the conductor wires 119 to 123 inclusive and is connected to one end of the

winding of the relay magnet 106. A conductor wire 126 is connected across all of the conductor wires 114 to 118 inclusive and is connected to the other end of the winding of the relay magnet. The motor circuit wire 6 is connected across all of the wires 114 to 118 inclusive. This completes the wiring.

To set the device to tune in selectively any of the stations A to E inclusive, at predetermined times, all that is necessary is to remove the cover plate 80 and arrange pins 60 in selected ones of the openings 64, in a predetermined pattern, an example of which will now be given.

Suppose it is desired to receive the broadcasting station A beginning at 7:30 and ending at 7:45 o'clock. Three pins are inserted in the 7:30 o'clock openings A, F, and G. A pin is inserted in the 7:45 o'clock opening H and also a pin is inserted in the 7:45 o'clock opening F.

When the pin in the 7:30 o'clock opening F engages the plunger switch contact 74, current will flow in the circuit which may be traced from the transformer through the wire 77, contact 75, contact 74, station selector base plate 62, pin in the G opening, wire 110, switch starting magnet 95 and wire 112 back to the transformer 99. The starting magnet 95 is thus energized and closes the switch 92 to supply current from the power line to the power pack of the instrument.

At the same time the current will also flow in a circuit which may be traced from the base plate 62 of the station selector disc, pin in the A opening, wire 114, motor stopping magnet 49, wires 119 and 124 to the transformer 99, thus energizing the magnet 49.

Also at the same time current will flow in a circuit which may be traced from the wire 114, wire 6, motor 15, wire 41, disc 36, conductor pin 42, disc 9 and wire 7 to the transformer 99. The motor is thus started and turns both the tuning condenser of the instrument, and the discs 36 and 9.

When the armature 46 on the conductor pin 42 arrives at the magnet 49, which latter is located to correspond to the point on the tuning dial of the instrument at which the broadcasting station A tunes in, the magnet 49 will attract the armature and move the conductor pin 42 out of engagement with the disc 9 to break the motor circuit and stop the motor.

Broadcasting station A will thus be tuned in and received until the pins in the 7:45 o'clock H and F openings of the selector disc advance into engagement with the switch contacts 70 and 74 respectively. Thereupon current will flow in a circuit which may be traced from the transformer 99, wire 77, contact 74, pin in F opening, selector disc base plate 62, pin in the H opening, conductor wire 109, stopping magnet 96, and wire 111 back to the transformer. The stopping magnet is thereby energized to open the switch 92 and cut off the current from the instrument to stop reception.

There is no reception while the broadcasting station A is being tuned in because when the motor stopping magnet 49 is energized, as above described, the relay magnet 106 which controls current to the power pack 18 is simultaneously energized through a shunt circuit which may be traced from the wire 114, wire 126, relay magnet 106, wire 125, wire 119 and wire 124 back to the transformer 99. When the relay magnet 106 is energized by closing of this circuit the relay opens the circuit from the power line to the power pack and including the wire 100, wire 102, wire 75

103, relay 104, wire 105, and wire 101. After the motor has stopped the motor stopping magnet circuit is opened by the pin in the opening A being carried off its associated switch contact by rotation of the station selector disc. The motor stopping magnet 49 and the relay magnet 106 will then be simultaneously de-energized. De-energizing of the relay magnet permits the relay to close the power pack circuit just traced to start reception of the program from broadcasting station A.

The above described operation may be repeated by setting pins 66 in a predetermined pattern on the station selector disc to successively and automatically tune in and change the program from one to the other of the stations A, B, C, D, and E.

While automatic apparatus has been above described in connection with manipulation of the tuning dial, it will be here pointed out that the manual volume and pitch control dials of a radio instrument may also be operated by apparatus constructed as above described, with separate motors and magnetic coils for each one, and having current lines connected to the automatic tuning device. In the event that the station selector dial, the volume dial, and the pitch control dial of the radio instrument do not turn always in one direction, obviously the use of a reverse motor with a reversible switch for each, will be necessary. And finally although only five radio broadcasting stations have been described as being selectively tuned in and out, a less or greater number of stations may be provided for in the apparatus.

From the above description it is thought that the construction and operation of the invention will be fully understood without further explanation.

40 What is claimed is:

1. An automatic station selector and tuning device for radio receiving instruments comprising a plurality of control circuits each connected with a source of electrical energy, a continuously rotating clock driven disc of conducting material, a plurality of concentric circular series of pin receiving openings in the disc equal in number to the number of control circuits, a stationary series of switch contacts in the control circuits extending radially of the disc, pins forming switch contacts and adapted to be arranged in a predetermined pattern in said openings in the disc to individually engage the stationary switch contacts and thereby selectively close the control circuits, rotation of the disc carrying the pins out of contact with the switch contacts to open the circuits, a circuit for supplying power to the receiving instrument, a relay in said circuit, a knife switch in the relay circuit, electro-magnets for opening and closing the switch, certain of said control circuits being connected respectively to said electro-magnets whereby the switch is closed and opened at predetermined times, a motor, a circuit for the motor connected with a source of electricity and connected with each of said control circuits whereby the motor is started when each control circuit is closed, a tuning shaft driven by the motor, electro-magnets in certain of the control circuits in parallel with the motor circuit, a normally closed magnetically controlled switch in series with the motor circuit and rotatable as a unit with the tuning shaft, said rotatable switch being adapted to be opened by the energizing of said magnets selectively to open the motor circuit, and a shunt circuit connected across all of the

electro-magnets and including the magnet of the relay whereby when the electro-magnets are energized the relay opens the power circuit to the instrument and when the electro-magnets are de-energized the relay closes the power circuit to the instrument.

2. In an automatic station selector and tuning device for radio receiving instruments, the combination with a plurality of circuits and circuit closers therein adapted to selectively open and close the circuits, of a motor controlled by said circuits for tuning the instrument, a tuning shaft clutched to the motor, a pair of spaced discs fixed to the shaft and rotatable by the shaft, a circuit for the motor, said discs forming terminals of the motor circuit, a spring pressed conductor pin carried by one of the discs and normally engaging the other disc to maintain the motor circuit closed at the discs, an armature on the pin, and a series of individual electro-magnets in said plurality of circuits arranged circumferentially about said shaft and adapted to selectively attract the armature and move the control pin to open the motor circuit at the discs.

3. In an automatic station selector and tuning device for radio receiving instruments, a clock, a disc of conducting material fixed to and rotated by the hour hand arbor of the clock, said disc having a plurality of concentric circular series of pin receiving openings therein, a support contiguous to the clock, switch contacts on the support extending radially across all of the circular series of openings, circuit closing pins adapted to be arranged in said openings in a predetermined pattern to be intercepted by the contacts, a plurality of control circuits in which the contacts are disposed, the openings being aligned in radial rows on the disc, time designating numerals at the outer ends of the radial rows of openings designating fifteen minute intervals through a period of twelve hours and progressing counter-clockwise, means controlled by the control circuits individually and operatively connected to the instrument for tuning the instrument, a cover plate removably associated in superposed position on the disc and turning as a unit with the disc, a stationary flange outside of the cover plate, a clock dial on the flange, a pointer on the cover plate coacting with the dial whereby time may be determined, and sockets in the underneath face of the cover plate for receiving the upper ends of certain of said pins.

4. In an automatic station selector and tuning device for radio receiving instruments, a condenser shaft, a tuning shaft aligned with the condenser shaft, a sleeve on the end of the tuning shaft splined to the condenser shaft whereby the tuning shaft may be pulled outwardly to manually tune the instrument or may be pushed inwardly to permit of the instrument being mechanically tuned, a motor, a slow motion transmission mechanism driven by the motor and including a driven shaft, a conical friction clutch pulley on the driven shaft, a conical friction clutch pulley on the tuning shaft engaging the first named pulley when the tuning shaft is disposed at its inner limit of movement, outward movement of the tuning shaft disengaging the pulleys from each other, a collar on the tuning shaft, and a spring dog secured stationary at one end and having the free end adapted to engage over the collar and yieldably latch the tuning shaft at its outer limit of movement.

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