Oct. 19, 1937.

S. SPAGNOLA

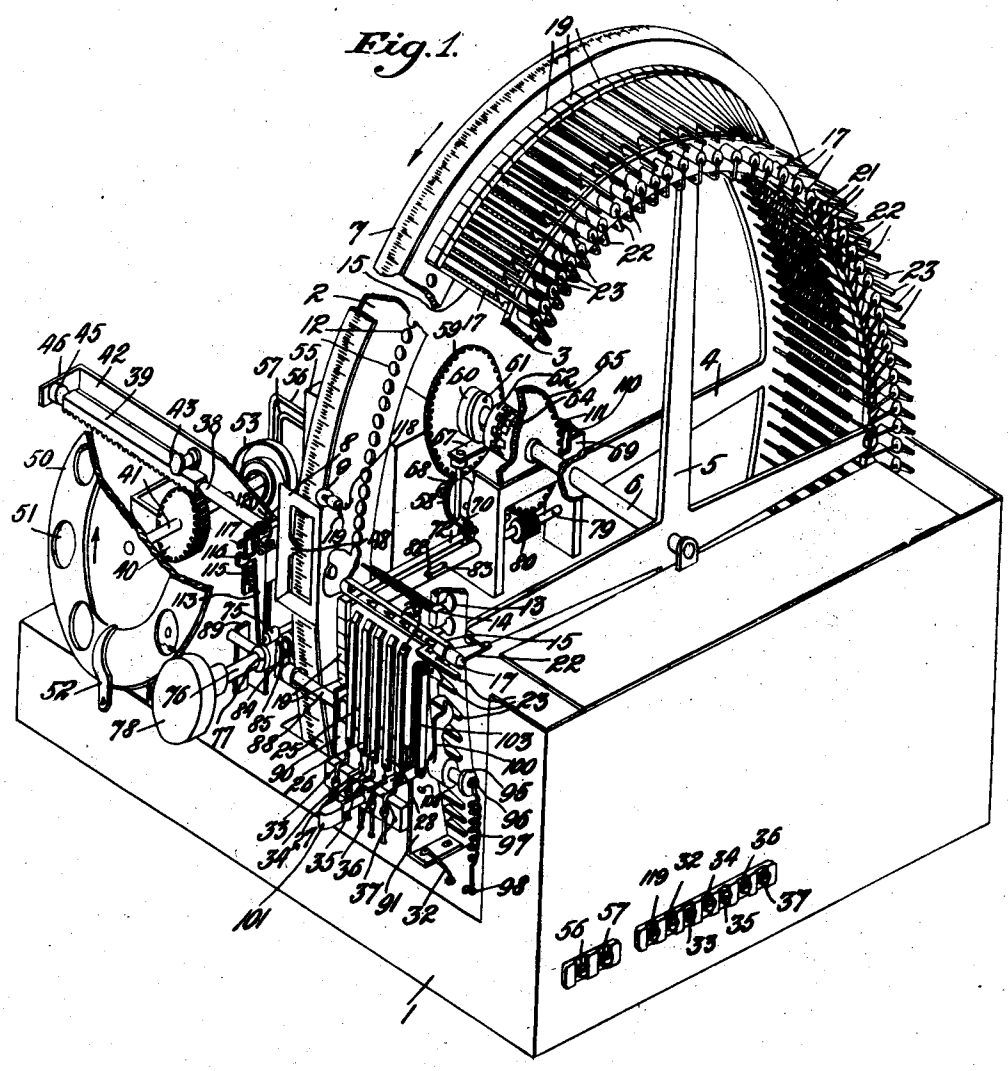
2,096,072

AUTOMATIC RADIO PROGRAM SELECTOR

Filed April 20, 1935

7 Sheets-Sheet 1

Fig. 1.



INVENTOR
SAMUEL SPAGNOLA
BY D Malcolm
ATTORNEY

Oct. 19, 1937. S. SPAGNOLA 2,096,072

AUTOMATIC RADIO PROGRAM SELECTOR

Filed April 20, 1935 7 Sheets-Sheet 2

Fig. 3.

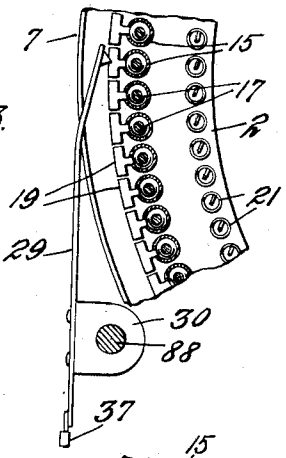
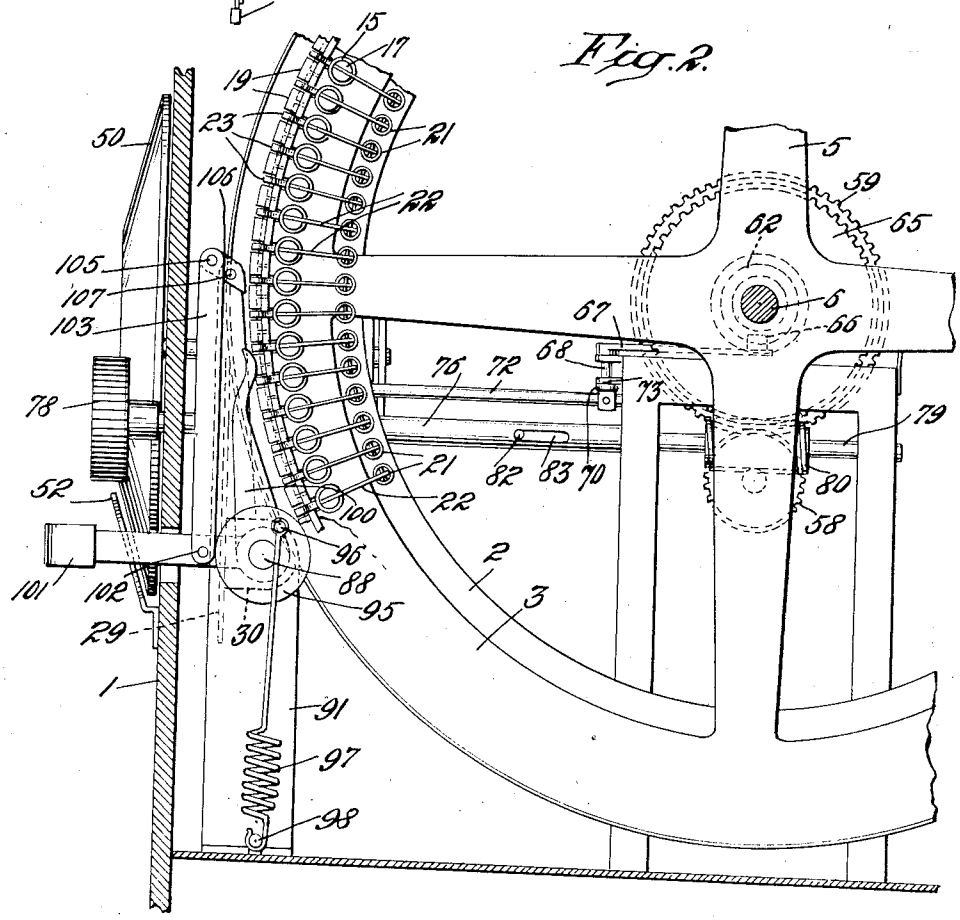


Fig. 2.



INVENTOR
SAMUEL SPAGNOLA
BY D Malcolm
ATTORNEY

Oct. 19, 1937. S. SPAGNOLA 2,096,072

AUTOMATIC RADIO PROGRAM SELECTOR

Filed April 20, 1935 7 Sheets-Sheet 3

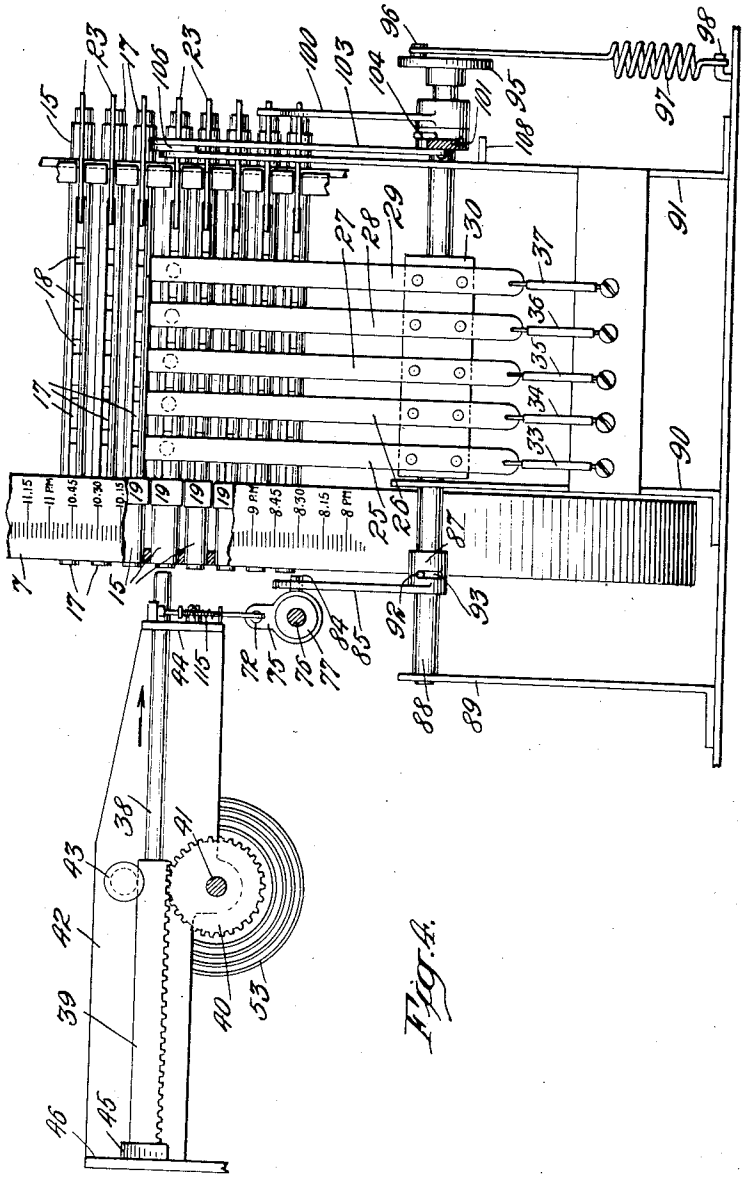


Fig. 4.

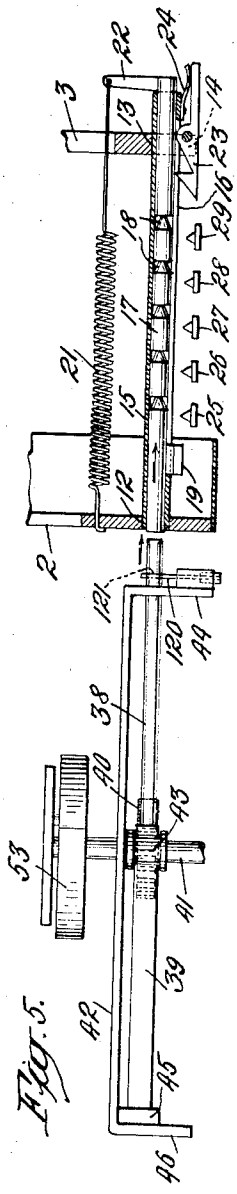


Fig. 5.

INVENTOR
SAMUEL SPAGNOLA
BY D Malcolm
ATTORNEY

Oct. 19, 1937. S. SPAGNOLA 2,096,072

AUTOMATIC RADIO PROGRAM SELECTOR

Filed April 20, 1935 7 Sheets-Sheet 4

Fig. 6.

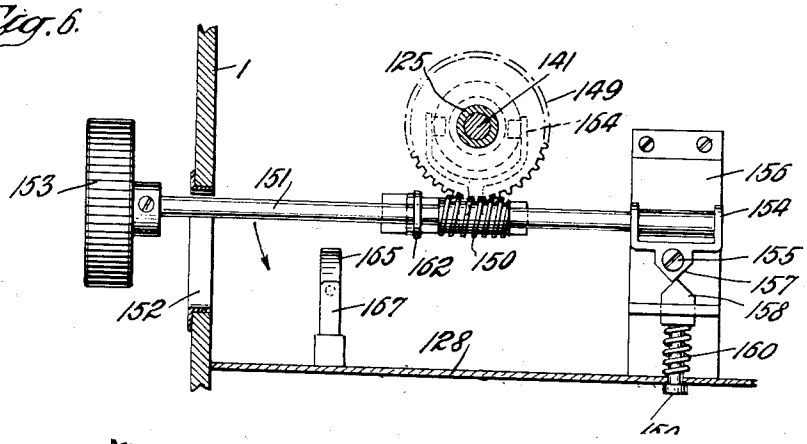


Fig. 7.

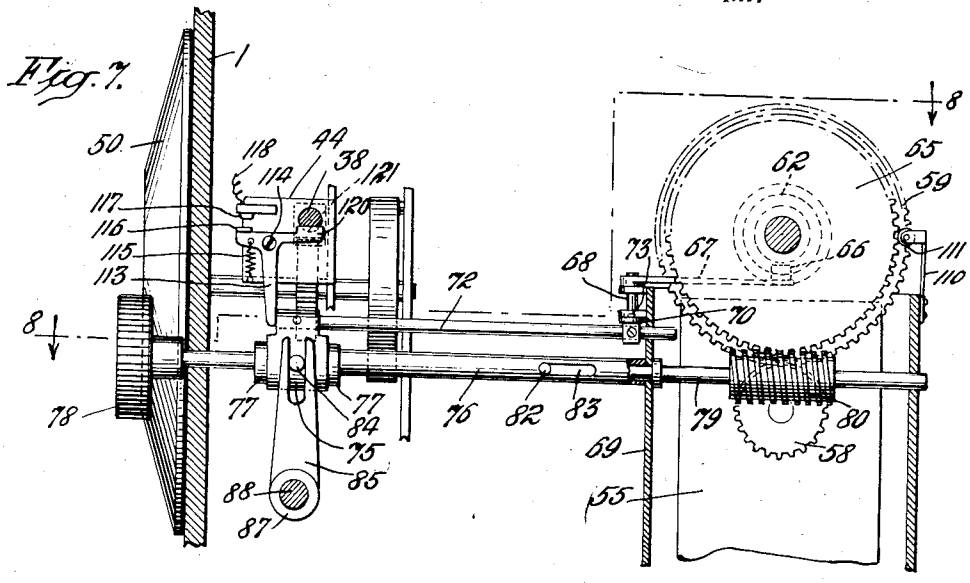
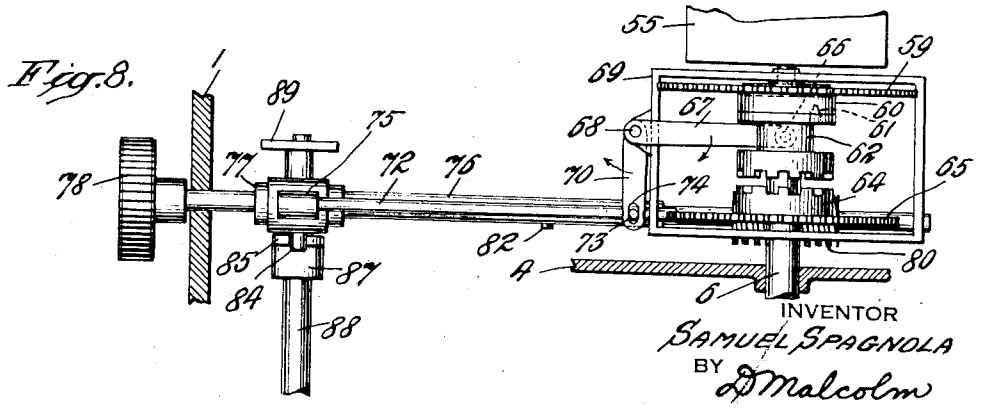


Fig. 8.



INVENTOR
SAMUEL SPAGNOLA
BY D Malcolm
ATTORNEY

Oct. 19, 1937. S. SPAGNOLA 2,096,072

AUTOMATIC RADIO PROGRAM SELECTOR

Filed April 20, 1935 7 Sheets-Sheet 5

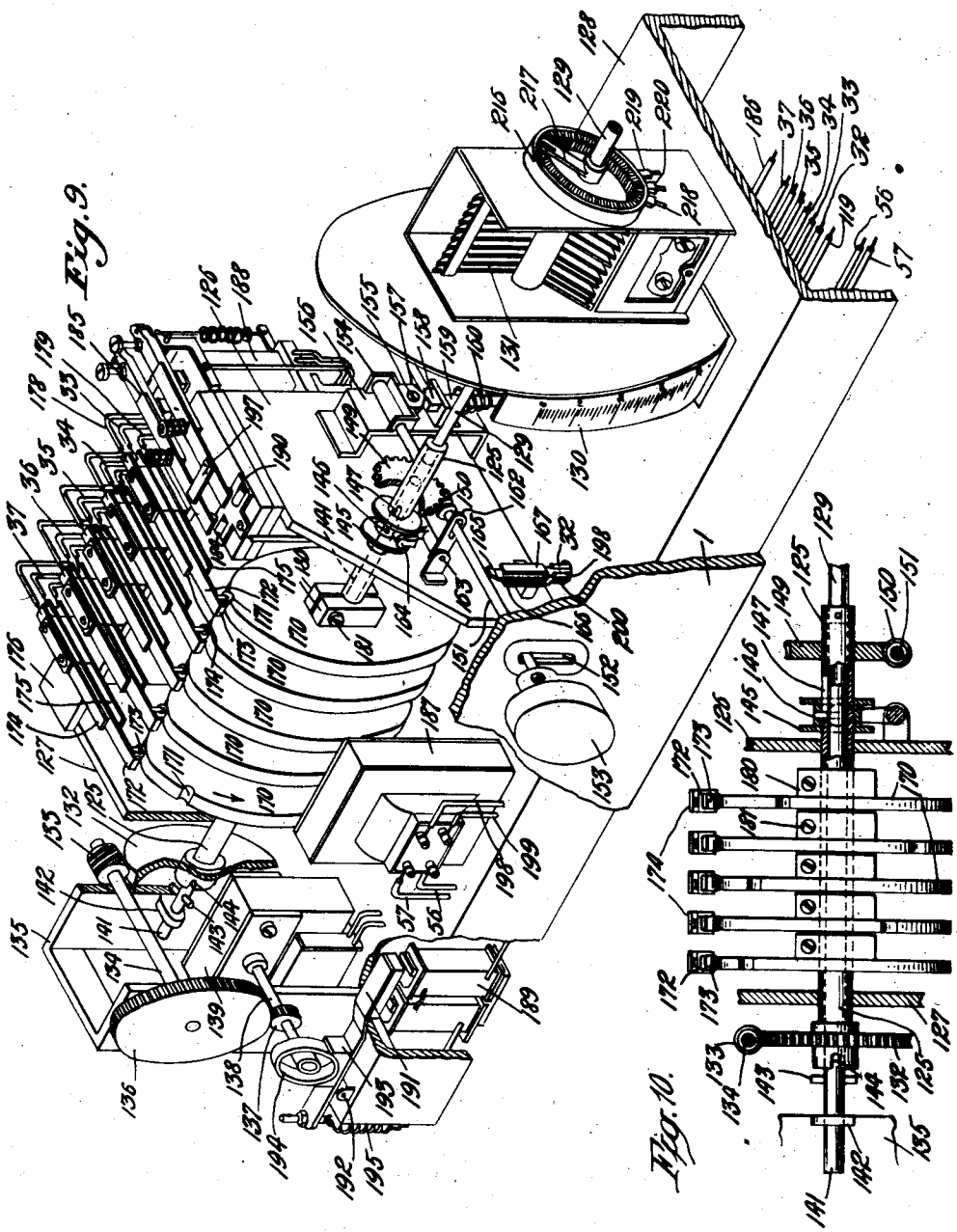


Fig. 9.

Fig. 10.

INVENTOR
SAMUEL SPAGNOLA
BY D Malcolm
ATTORNEY

Oct. 19, 1937. S. SPAGNOLA 2,096,072

AUTOMATIC RADIO PROGRAM SELECTOR

Filed April 20, 1935 7 Sheets-Sheet 6

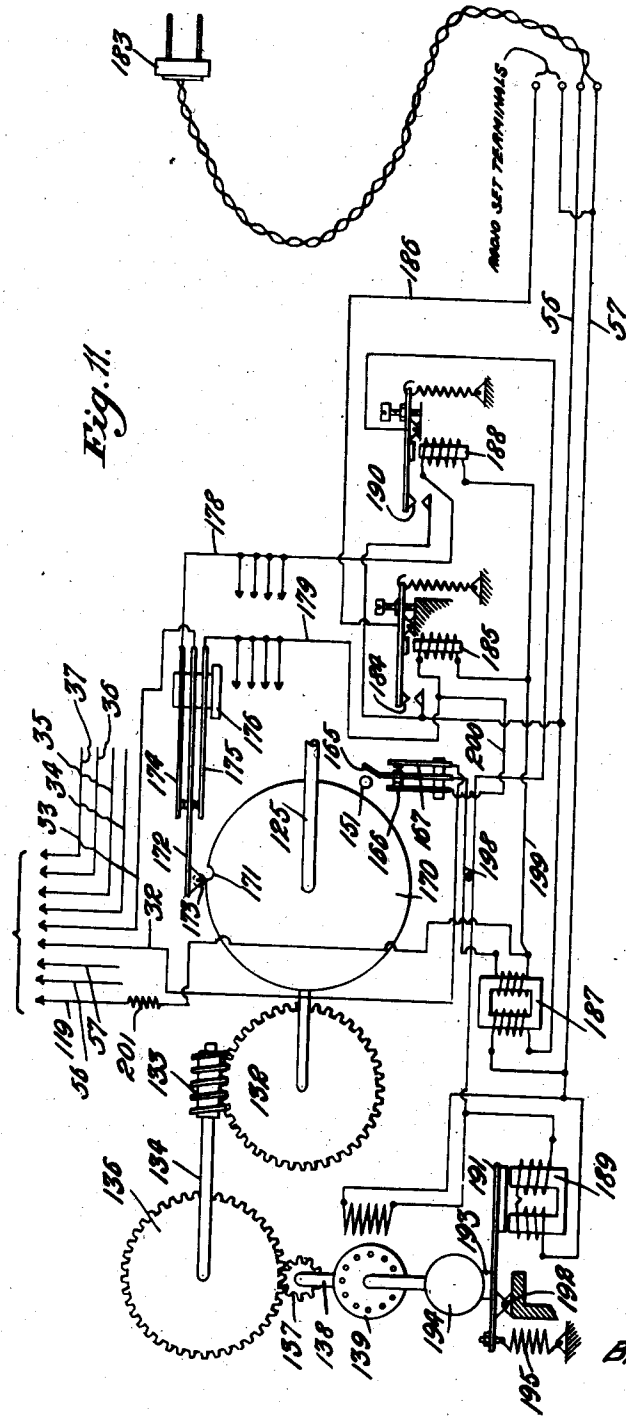


Fig. 11.

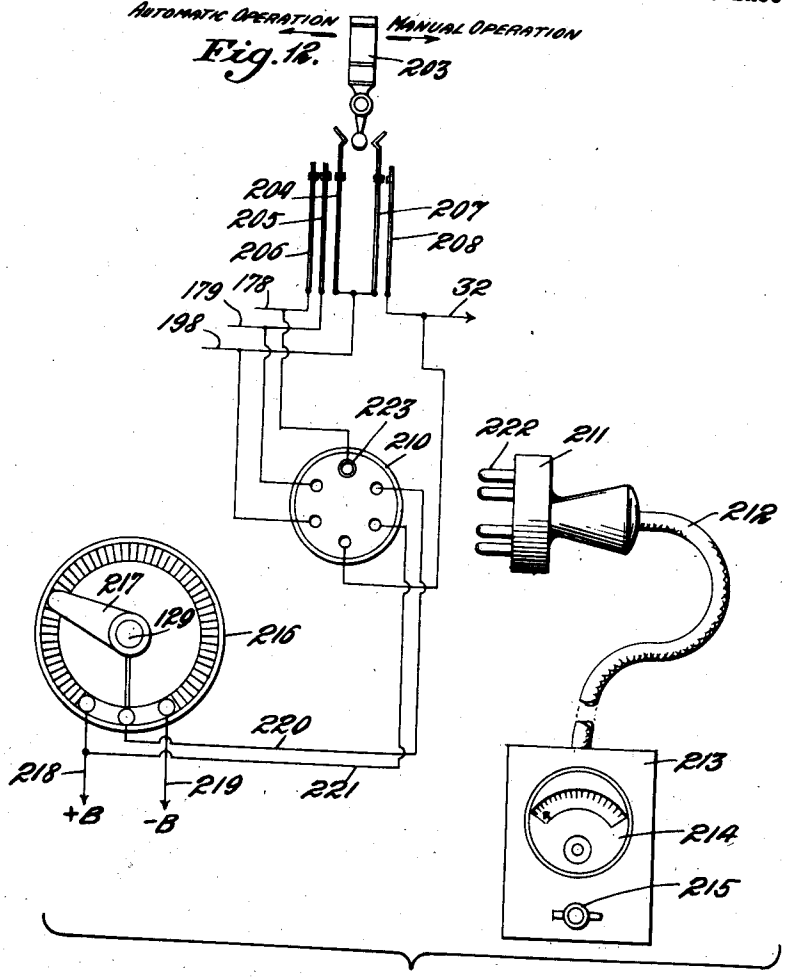
INVENTOR
SAMUEL SPAGNOLA
BY D Malcolm
ATTORNEY

Oct. 19, 1937. S. SPAGNOLA 2,096,072

AUTOMATIC RADIO PROGRAM SELECTOR

Filed April 20, 1935 7 Sheets-Sheet 7

Fig. 12.



INVENTOR
SAMUEL SPAGNOLA
BY D Malcolm
ATTORNEY

Patented Oct. 19, 1937 2,096,072

UNITED STATES PATENT OFFICE

2,096,072

AUTOMATIC RADIO PROGRAM SELECTOR

Samuel Spagnola, Tuckahoe, N. Y.

Application April 20, 1935, Serial No. 17,411

17 Claims. (Cl. 250—20)

This invention relates to a system and apparatus for operating radio receivers automatically in accordance with a preselected program or series of programs.

The principal object of the invention is to provide a system and apparatus of the type specified which may be applied to any radio receiver and which, when so applied, will operate said receiver and deliver preselected broadcast programs for an extended period of time without manual control or supervision of any kind.

Further objects of the invention are to provide a simple and highly accurate program selecting mechanism which may be operated without requiring special knowledge or skill; to provide means for instantly cutting off an undesired station during the selecting process or during the playing of a program; to provide means for operating the radio set by hand to obtain any desired station at any time without impairing the setting of the automatic station selector, so that automatic operation may be resumed according to the prearranged program when desired; to provide means for operating the set semi-automatically or by remote control; and in general to simplify the construction and operation of automatic radio sets by the many improvements and refinements hereinafter described.

Radio broadcasting is standardized to such an extent that practically all programs are published in the newspapers at least a day ahead of time. Most people refer to such papers and check off the programs they wish to hear; then, when the time arrives for a chosen program, they turn on the set and tune in the station by hand, and, of course, turn it off when the program is finished. My invention, however, makes it possible to select a whole series of radio programs, from various broadcast stations, hours or even days ahead of time, and after a simple setting operation enables the apparatus to deliver these programs on exact schedule without the slightest manual control or supervision. The mechanisms which I have chosen to illustrate my invention are arranged to handle a twenty-four hour schedule of programs but may be adapted for longer or shorter schedules without any change in the principles of construction and operation hereinafter described.

In its preferred form my invention includes a program member which may comprise a rotatable drum driven at a definite speed as by a clock. In the form illustrated, the clock rotates the drum once every twenty-four hours. The drum carries a plurality of adjustable contacts each of which represents a fifteen-minute radio program, this time interval being used for purposes of illustration because it is customary to divide radio programs into fifteen-minute periods. Means are provided for setting the drum contacts in various positions allotted to individual broadcasting stations, and for this purpose I prefer to use an ordinary telephone calling dial although other means may be employed if desired. In the form shown, the operator simply rotates the selector drum by means of a knob until a desired quarter-hour mark shows on a scale, after which he turns the calling dial up to a finger hole allotted to the particular broadcasting station which he wants to hear during the stated quarter-hour period. This operation instantly sets the contact allotted to that quarter-hour period in proper position to operate the radio set and tune in the desired station when the time for that program arrives. The operator continues to rotate the selector drum and operate the calling dial until the drum has absorbed all the desired programs, after which the set is ready to operate automatically.

As the selector drum rotates in step with the clock, each contact will arrive at a predetermined point at exactly the time scheduled for the program allotted to said contact. When this happens, the contact closes an electric circuit which energizes the radio receiving set and tunes it precisely to the preselected station. At the conclusion of the program the radio set is automatically turned off unless the next contact on the selector drum happens to be set to the same or another station, in which case it will function to deliver the next program. If no program has been selected for a given period, none will be delivered. If the listener does not like a program which is being played, he can shut it off by simply pressing a button or lever without in any way impairing the continuity of subsequent programs. He can also do this to rectify mistakes, if such there be, at the time of dialing. The apparatus can likewise be shifted instantly from automatic to manual operation, enabling the operator to tune in local or distant stations not represented on the selector, after which automatic operation may be resumed with no interruption in the continuity of subsequent programs. According to another feature of the invention this manual tuning-in may be accomplished semi-automatically, or by throwing a switch instead of manipulating the usual hand controls. According to still another feature of the invention the set may be operated by remote control, that is, from across

the room or from any other locality however remote from the set itself.

Important advantages of my radio program selector are its simplicity, accuracy and ease of operation, which will become more apparent as the description proceeds. Other program selectors have been proposed in the past but they have never proved successful because of the tedious and bewildering procedure involved in setting a program and the precautions necessary to avoid mistakes in operation. My apparatus overcomes these disadvantages and avoids previous difficulties in the way of properly selecting radio programs with a minimum of effort and the delivery of these programs at the proper times and in the proper signal channels.

These and other features and advantages of the invention will be described in connection with the accompanying drawings, in which:

Fig. 1 is a perspective view of the program selector switch mechanism;

Fig. 2 is a partial end view of the selector drum;

Fig. 3 is a detail of the selector drum showing one of the cooperating selector contacts;

Fig. 4 is an elevation of the dialing and contactor mechanisms of the selector;

Fig. 5 is a plan view of the mechanisms shown in Fig. 4;

Fig. 6 is a detail of the manual drive for the tuning mechanism shown in Fig. 9;

Fig. 7 is a detail of the manual control for setting the selector drum of Figs. 1 and 2;

Fig. 8 is a horizontal section taken on line 8—8 of Fig. 7;

Fig. 9 is a perspective view of the automatic tuning mechanism which operates the radio under control of the selector switch mechanism of Fig. 1;

Fig. 10 is a detail of the jack shaft and switch actuating cam discs of Fig. 9;

Fig. 11 is a wiring diagram for the tuning mechanism of Fig. 9; and

Fig. 12 is a diagrammatic view of the semi-automatic and remote control circuits for the selecting mechanism.

In order to simplify the description the system shown in the drawings may be considered as divided into two parts, namely, the program or selector mechanism of Fig. 1, and the radio set control or tuning mechanism of Fig. 9. There is no physical connection between these two mechanisms except that they are both conveniently mounted inside the cabinet of the radio receiving set which they control, the front panel of such set being designated by the numeral 1 in Figs. 1 and 9. The mechanisms of Figs. 1 and 9, however, are electrically connected as hereinafter described.

The mechanism of Fig. 1 is the actual program selecting mechanism. In the form illustrated it includes a dial, similar to a telephone dial, and a time-controlled selector drum. All programs are selected in advance by simply turning the said dial and drum as hereinafter described. Thereafter, the drum is rotated by a clock mechanism, and, as soon as the drum arrives at a point corresponding to the time when a preselected program is to go "on the air", it closes a contact which operates the radio tuning mechanism of Fig. 9. The mechanism of Fig. 9 turns on the radio set and tunes it to the aforesaid preselected station. At the conclusion of the preselected broadcast the radio set is automatically turned off and remains deenergized until the time arrives for another preselected program, at which time the set is operated automatically as before.

I shall now describe, in the order named: the program selecting mechanism of Fig. 1; the radio set operating and tuning mechanism of Fig. 9; the operation of the system as a whole; and, lastly, the semi-automatic and remote control systems.

Program selecting mechanism

The program member shown in Fig. 1 comprises a rotatable index wheel or drum having spaced parallel flanges 2 and 3 carried by spiders 4 and 5 which are secured to rotatable shaft 6.

The flange 2 of the drum carries a continuous band 7 comprising a scale which is graduated in fifteen minute intervals. These fifteen minute graduations are the long lines shown on the scale 7 in Fig. 1. The drum is driven at the rate of one revolution each twenty-four hours as hereinafter described; hence the scale 7 is graduated into ninety-six equally spaced lines each representing a period of fifteen minutes.

This particular scale, with graduations arranged at fifteen minute intervals, is used simply because it is customary to divide radio programs into periods of fifteen minutes each. This holds true even for longer broadcast programs as there is always a pause for station announcements at the end of each fifteen minute period. It is to be understood, however, that my selector drum may be calibrated and otherwise adjusted to function at other than the standard fifteen minute interval if this should be desirable for any reason.

The selector drum rotates in the direction of the arrow in Fig. 1, moving the scale 7 past a window 8 which is mounted in the front panel 1 of the radio cabinet. The scale is illuminated at the window 8 by a lamp 9 which is lighted, as hereinafter described, whenever the drum is operated manually for the purpose of preselecting the day's programs. Preferably one-half of the scale 7 is made with black calibrations and numerals for the hours on a white field to indicate day programs, while the other half of the scale is made with white calibrations and numerals indicating evening programs.

The flanges 2 and 3 of the selector drum contain circular series of round holes 12 and 13 respectively, the holes 12 of flange 2 being aligned with the holes 13 of flange 3. Slots 14 are cut through the periphery of flange 3 into each of the holes 13 as shown in Fig. 1. There are ninety-six holes 12 in flange 2 and a corresponding number of holes 13 in flange 3, or one set of holes 12—13 for each fifteen minute interval on the twenty-four hour selector drum. Each such set or pair of holes 12—13 is aligned with one of the fifteen minute graduations on the scale 7. In each set of holes 12—13 is mounted a tube 15 as shown in Figs. 1, 4 and 5. Each tube 15 contains a longitudinal slot 16 which extends the entire length of the tube except for the small portion which extends into the flange 2, and each slot 16 is aligned with the slot 14 of the corresponding hole 13 in flange 3 as best shown in Figs. 4 and 5. In each tube 15, free to slide therein, is a rod 17 which is disposed transversely or at right angles to the plane of rotation of the drum and contains spaced notches 18. Adjacent its inner end, or at the left as viewed in Figs. 1, 4 and 5, each rod 17 carries a contact member or segment 19 having a neck which projects through the longitudinal slot 16 in the associated tube 15. The rods 17 are normally held inside their respective tubes 15

by means of springs 21 which have one end fastened to flange 2 of the drum and the other end fastened to a cantilever 22 on the outer end of each rod 17.

In the embodiment shown in the drawings, particularly Figs. 4 and 5, the notches 18 in rods 17 are five in number. Whenever any rod 17 is moved outwardly in its tube 15, or toward the right as viewed in Figs. 1, 4 and 5, one or another of the notches 18 in such rod is engaged by a catch 23 pivoted in the adjacent slot 14 in the flange 3 of the drum, thereby holding the rod 17 in said extended outward position. Each rod 17 has its own catch 23 and each such catch has a leaf spring 24 which is flexed to force the catch inwardly into engagement with the notches 18 as indicated in Fig. 5. Whenever a rod 17 is held in extended position by its catch 23, it can be released only by tripping said catch about its pivot as hereinafter described. Whenever a rod 17 is moved in its tube 15 it of course carries its contact segment 19 with it, and the notches 18 in each rod are spaced to cause the rod to stop in such position that contact segment 19 will be in exact line with one or another of the contact members or fingers 25, 26, 27, 28 or 29 which are mounted on an insulating block 30 in front of the drum as shown in Figs. 1 to 5. When a contact segment 19 is thus set in line with one or another of the contact fingers 25—29 it will engage such finger at a prearranged time during the rotation of the selector drum. The contact segments 19 are of such length that they will remain in engagement with the fingers 25—29 for fifteen minutes, corresponding to one broadcast period, after which the rotating drum will carry the segments beyond said fingers. During the period of engagement between a contact segment 19 and one of the contact fingers 25—29 the radio circuit of Figs. 9 and 11 is completed, automatically operating the radio set and delivering the preselected program. This operation will be described later; for the present it is sufficient to say that the operating circuit, so far as it concerns the selector drum mechanism of Figs. 1 to 5, extends from conductor 32 to the metal chassis of the selector drum, and thence through contact segment 19, one or another of the contact fingers 25—29, and one or another of conductors 33, 34, 35, 36 or 37, to the radio set operating and tuning mechanism of Figs. 9 and 11.

The mechanism for automatically setting the contact segments 19 to preselect radio programs will now be described. This mechanism includes a rod or ram 38 carried by rack 39 which is actuated by gear 40 on shaft 41 journaled in frame 42. The rack 39 is confined in its travel by a flanged roller 43 on frame 42 while the ram 38 extends through a hole in the inner end 44 of frame 42 which serves to guide the ram. The outer end of rack 39 carries a bumper 45 of rubber or the like adapted to engage the outer end 46 of frame 42 to cushion the impact of the rack when it returns to the normal position shown in Figs. 1, 4 and 5 of the drawings. The ram 38 is preferably of the same diameter as the rods 17 of the selector drum, although it may be of smaller diameter; and said ram is supported in a plane perpendicular to the drum flange 2 in such position that it will be in exact alignment with any rod 17 whenever the graduation of scale 7 allotted to said rod is aligned with pointer 48 in the window 8 at the front of the radio cabinet. Thus, whenever any graduation representing a fifteen minute period on scale 7 is aligned with the pointer 48 in window 8, the rod 17 behind such graduation will be in exact alignment with ram 38; then, when ram 38 is moved toward the right in Figs. 1, 4 and 5, it will push said rod 17 through its tube 15 against the tension of its spring 21 until its catch 23 engages one or another of the notches 18 in said rod 17 and thereby locks said rod in the shifted position with its contact segment 19 in line with one or another of the contact fingers 25—29, according to the length of travel of said ram 38 and rod 17.

Gear 40, which actuates rack 39 and ram 38, is rotated by dial 50 secured to shaft 41. This dial is similar to an ordinary telephone dial, having the usual finger holes 51 and stationary finger piece 52 limiting the travel of the dial. A coil spring 53 is secured to shaft 41 for the purpose of returning dial 50, rack 39 and ram 38 to the normal retracted position shown in Figs. 1, 4 and 5; preferably the dial 50 is also provided with a suitable governor of the type commonly employed in telephone dials. Each finger hole 51 in dial 50 represents an individual radio station. In the apparatus shown in the drawings there are five contact fingers 25, 26, 27, 28 and 29 cooperating with the selector drum (Figs. 1, 4 and 5), hence this particular apparatus is capable of handling only five different radio stations although it will be understood that the apparatus may be modified to handle as many stations as desired. I have chosen a five-station set for purposes of illustration because there are seldom more than five first class radio stations available in any given locality; and, of course, additional stations not represented on the dial 50 can always be tuned in manually when desired. Having decided upon the radio stations desired in the locality where the set is to be used, one of the finger holes 51 of dial 50 is assigned to each such station and appropriately labeled, as "WEAF", "WJZ", etc. It makes no difference which finger hole is assigned to a given station although it is convenient to distribute the stations around the dial according to their wave lengths. Thereafter, in order to set the selector drum for any particular station at any particular time, the operator simply rotates the selector drum in a manner hereinafter described until the desired time marker on scale 7 is aligned with pointer 48 in window 8, then inserts his finger in the finger hole 51 assigned to the desired station, and then rotates the dial in a clockwise direction until restrained by stationary finger piece 52, after which the dial is released and allowed to return to its normal position. This operation moves and locks a contact segment 19 in line with one of the contact fingers 25—29, which contact fingers are connected by their respective conductors 33—37 to the radio set operating and tuning mechanism of Figs. 9 and 11 which is adjusted in a manner hereinafter described to correspond with the setting of the dial 50 and selector drum mechanism.

The selector drum of Fig. 1 is rotated by a synchronous electric clock 55 which is connected by conductors 56—57 to any suitable source of current such as the alternating current mains of a house lighting system. The clock shaft driving the hour hand carries a gear 58 which drives gear 59 in a 2:1 ratio so as to drive the selector drum at the rate of one complete revolution per twenty-four hour day. Gear 59 has a hub 60 in which is reamed a tapered hole adapted to receive a tapered pin 61 which is carried by the outer or left-hand flange of the spool-shaped shaft cou-

pling 62 as shown in Figs. 1 and 8. Coupling 62 is secured to shaft 6 of the selector drum by means of a sliding feather key, not shown, permitting said coupling 62 to slide longitudinally on shaft 6 while requiring shaft 6 and coupling 62 to rotate in unison. The inner or right-hand flange of coupling 62 is serrated so as to engage in corresponding teeth in the hub 64 of gear 65. Gears 59 and 65 are both loosely mounted on shaft 6, being free to rotate about said shaft. Lying in the reduced central shank of the spool-shaped coupling 62 is a guide pin 66 which is carried by lever 67, Figs. 7 and 8, for the purpose of moving said coupling 62 into engagement either with hub 60 of gear 59 or hub 64 of gear 65. Lever 67 is secured to a shaft 68 which is journaled in frame 69 and secured at its lower end to lever 70 as shown in Figs. 1, 2, 7 and 8. Lever 70 is actuated by rod 72 carrying a pin 73 which engages in a slot 74 adjacent the end of said lever 70 as shown in Figs. 7 and 8. At its inner end rod 72 extends through frame 69 while at its outer end said rod is secured to a collar 75 which is rotatably mounted on shaft 76 extending parallel to rod 72. Collar 75 is held in place on shaft 76 by two positioning collars 77 which are fixed to said shaft as shown in Figs. 7 and 8. On its outer end shaft 76 carries an actuating knob 78 which extends outside the front panel 1 of the radio cabinet, while the inner end of said shaft is bored hollow and carries within it one end of a stub shaft 79 which is journaled in frame 69 and carries worm 80 in constant mesh with gear 65. A pin 82 on stub shaft 79 extends through longitudinal slot 83 in the hollow portion of shaft 76 as show nin Figs. 1, 2, 7 and 8, from which it will be seen that shaft 76 and stub shaft 79 necessarily rotate together. It will likewise be evident that this telescoping arrangement of shaft 76 and stub shaft 79 permits shaft 76 to be pulled out (toward the left as viewed in Figs. 2, 7 and 8) by means of its knob 78 for a distance equal to the length of slot 83, such longitudinal movement of shaft 76 being limited by the engagement of pin 82 with the ends of said slot 83.

Collar 75 on shaft 76 carries a pin 84 which engages in a forked lever 85 having a hub 87 journaled on horizontal shaft 88 in front of the selector drum. Shaft 88 is rotatably mounted in supports 89, 90 and 91 as shown in Figs. 1 and 4. A pin 92 secured to shaft 88 tracks in a short arcuate slot 93 in hub 87 as shown in Fig. 4, enabling lever 85 to rotate shaft 88 whenever pin 92 engages either end of slot 93, while at the same time permitting shaft 88 to be rotated slightly by other means without actuating lever 85 or shaft 76. At its other end, to the right as viewed in Figs. 1 and 4, shaft 88 carries a disc 95 having a pin 96 adjacent its upper peripheral edge. A spring 97 is connected at one end to said pin 96 and at the other end to a hook 98 on the base of the radio cabinet as shown in Figs. 1, 2 and 4. When shaft 76 is pulled out by means of knob 78 it actuates lever 85 through pin 84, the hub 87 of lever 85 thereby engaging pin 92 and rotating shaft 88. Before knob 78 on shaft 76 is pulled out its maximum distance, shaft 88, carrying disc 95, will rotate pin 96 over the top center of said disc 95, whereupon the tension of spring 97 will further rotate shaft 88 and hold same in actuated position with pin 92 against the lower end of slot 93 of hub 87. When knob 78 and shaft 76 are again pushed back to the normal position shown in Figs. 1, 2, 4, 7 and 8, pin 92 is engaged by the lower end of slot 93, thereby rotating shaft 88 until pin 96 on disc 95 is returned across the top center of said disc. Hence, just before knob 78 and shaft 76 reach the limit of their inward travel, pin 96 will cross the top center of disc 95, whereupon the tension of spring 97 will continue to rotate disc 95 and shaft 88 until said shaft is returned to its original position with pin 92 engaging the upper end of slot 93 as best shown in Fig. 4.

The insulating block 30 carrying contact fingers 25—29 is mounted on shaft 88 as shown in Figs. 1 to 4, the block being keyed to rotate with the shaft. Hence when knob 78 and shaft 76 are pulled out as described above, the resulting rotation of shaft 88 and block 30 will tip contact fingers 25—29 away from the selector drum thereby permitting the drum to rotate without bringing any of the previously set contact segments 19 into engagement with said contact fingers 25—29. Also mounted on shaft 88 is a trip finger 100, same being directly in the path of catches 23 on the selector drum so as to trip said catches about their pivots and thereby release rods 17 carrying contact segments 19 whenever a catch engages trip finger 100 during rotation of the drum. It is evident that trip finger 100 will be tilted back out of the path of catches 23 whenever knob 78 and shaft 76 are pulled out as previously described. It sometimes happens that an operator may dial the wrong radio station, or for other reasons may wish to change the setting of a contact segment 19 from a position allotted to one radio station to a position allotted to another radio station, making it necessary to return rod 17 and contact segment 19 to normal position. To accomplish this I provide a lever 101 secured to shaft 88 by a slot and pin connection 104 and pivoted at 102 to a vertical lever 103 as shown in Figs. 1, 2 and 4. At its upper end lever 103 is pivoted at 105 to a short trip finger 106, which finger is pivoted at 107 to the support 91. By depressing lever 101 until it engages stop 108, trip finger 106 will be rotated about its pivot 107 causing the free end of said trip finger 106 to strike the adjacent catch 23 thereby tripping said catch so that it releases its rod 17 and returns its contact segment 19 to its original position. When lever 101 is depressed in this manner it rotates shaft 88 through slot and pin connection 104 sufficiently to tip contact fingers 25—29 away from the selector drum, thus preventing contact segments 19 from striking said contact fingers. Such slight rotation of shaft 88, however, is not transmitted to shaft 76 and its associated elements because of the play afforded pin 92 by the arcuate slot 93 in the hub 87 of lever 85. On the other hand, the engagement of lever 101 with stop 108 does not prevent the more extended rotation of shaft 88 by actuating knob 78 because pin 104 on shaft 88 is free to move forward in its slot in the hub of lever 101 as shown in Fig. 4.

Longitudinal movement of knob 78 and shaft 76 causes corresponding movement of rod 72 which is secured to collar 75 on shaft 76 as previously described. Such longitudinal movement of rod 72 actuates lever 70 thereby rotating shaft 68 which, in turn, actuates lever 67 carrying guide pin 66 which lies in the reduced central shank of spool-shaped coupling 62 as shown in Figs. 1, 2, 7 and 8. When knob 78 is pulled out, the resulting movement of lever 67 and guide pin 66 is such as to move the serrated flange of coupling 62 into engagement with the teeth in hub 64 of gear 65, thereby permitting knob 78 to rotate the selector drum through shaft 76, stub shaft 78, worm 80,

gear 65 and shaft coupling 62 which is keyed to the selector drum shaft 6. On the other hand, when knob 78 is pushed inwardly the resulting movement of lever 67 and guide pin 66 is such as to move coupling 62 toward gear 59 until the tapered pin 61 of coupling 62 engages in the tapered hole in hub 60 of gear 59, thereby permitting clock 55 to drive the selector drum through gears 58 and 59 and shaft coupling 62. If pin 61 does not coincide with the tapered hole in hub 60 of gear 59 the knob 78 will be unable to complete its travel sufficiently to disengage coupling 62 from the teeth in hub 64 of gear 65, and spring 97 will be unable to ride over the top of disc 95 on shaft 88. Furthermore, the time reading on dial 7 will not coincide properly with pointer 48 in window 8 until pin 61 nests in the tapered hole in hub 60 of gear 59. When this condition prevails it is simply necessary to turn knob 78 slightly in either direction until pin 61 falls into the tapered hole in hub 60. On the rear of frame 69 is a light spring 110 carrying roller 111 which bears against a span of two teeth of gear 65 as shown in Figs. 1 and 7. This mechanism serves to register the quarter-hour graduations of scale 7 with pointer 48 in window 8 and therefore makes the center line of each tube 15 on the selector drum coincide exactly with the center line of ram 38 at the time of dialing the radio stations.

As shown in Figs. 1, 4 and 7, the inner end 44 of frame 42 carries a T-shaped trigger 113 which is pivoted to said frame at 114. The vertical shank of this trigger contacts with the edge of collar 75 on shaft 76, being held in engagement with said collar by spring 115 which is connected to one arm of trigger 113 and to the end frame 44 as shown in Fig. 7. This same arm of trigger 113 carries electrical contact 116 cooperating with contact 117 which is mounted on and suitably insulated from end frame 44 as shown in Fig. 7. Contact 117 is connected by conductor 118 to lamp 9 adjacent window 8 in the front panel 1 of the radio cabinet, and is thence connected by conductor 119 (Fig. 1) to the radio set operating and tuning mechanism of Figs. 9 and 11. The energizing circuit of lamp 9 will be traced later in the description of Figs. 9 and 11; for the present it is sufficient to point out that lamp 9 is lighted whenever contacts 116 and 117 are closed by pulling out knob 78 at the front of the cabinet, and, conversely, lamp 9 is extinguished when contacts 116 and 117 are opened by pushing knob 78 back to the normal position shown in Figs. 1 and 7. It will be remembered that the selector drum of Fig. 1 can be rotated by knob 78 only when said knob is pulled out, hence the lighting of lamp 9 is a signal to the operator that the drum is ready to be rotated by knob 78 for the purpose of selecting the day's radio programs. The T-shaped trigger 113 has a second arm 120 opposite contact 116 and this second arm 120 is adapted to enter slot 121 which is cut in ram 38 at right angles to the axis of said ram as shown in Figs. 5 and 7. When knob 78 is pushed in, as in Fig. 7, the arm 120 of trigger 113 rests in slot 121 of ram 38, thereby preventing accidental operation of dial 50 while the selector drum is being operated automatically by clock 55.

I shall now describe the radio tuning mechanism of Figs. 9 and 11, after which I shall describe the operation of the set as a whole.

Radio tuning mechanism

The radio set tuning mechanism of Figs. 9 and 11 includes a hollow shaft 125 which is rotatably mounted in supports 126 and 127 on the base 128. Shaft 125 is suitably keyed to radio set control shaft 129 carrying the usual tuning elements which are here represented by tuning dial 130 and condenser 131; hence dial 130 and condenser 131 rotate whenever shaft 125 is rotated by either the automatic or manual means which will now be described.

Shaft 125 carries worm wheel 132 which is free to turn on said shaft. Worm wheel 132 meshes with worm 133 on shaft 134 which is journaled in support 135 as shown in Fig. 9. Shaft 134 carries gear 136 meshing with pinion 137 on shaft 138 of electric motor 139 which may be any suitable type of reversible motor such as a single phase induction motor. Jack shaft 141 extends lengthwise through hollow shaft 125 and has its outer end slidably mounted in bearing 142 on support 135 as shown in Figs. 9 and 10. Jack shaft 141 is adapted to be coupled to worm wheel 132 by means of a pin 143 on the jack shaft and a cooperating slot 144 in the hub of worm wheel 132. A spool-shaped clutch 145 is loosely mounted on hollow shaft 125 and is fixed to jack shaft 141 by pin 146 passing through slot 147 in shaft 125 as shown in Figs. 9 and 10. It will thus be observed that the pin and slot connection 146—147 makes shaft 125 and jack shaft 141 rotate in unison while permitting the jack shaft to move lengthwise in shaft 125 a distance equal to the length of slot 147; and when clutch 145 is moved to the right-hand end of slot 147, as viewed in Figs. 9 and 10, pin 143 will engage in slot 144 in the hub of worm wheel 132, enabling motor 139 to rotate shafts 141 and 125 through the gear connections described above.

Shaft 125 carries worm wheel 149 adjacent clutch 145 as shown in Figs. 6, 9 and 10. This worm wheel is adapted to mesh with worm 150 carried by shaft 151 which projects through a vertical slot 152 in the front panel 1 of the radio cabinet and has an actuating knob 153 outside said panel. Shaft 151 is rotatably mounted in a carriage 154 which is pivoted at 155 to bracket 156 on support 126 as shown in Figs. 1 and 6. Carriage 154 has a wedge-shaped projection 157 on its lower edge cooperating with a similar wedge 158 on vertical plunger 159 which is surrounded by spring 160 compressed between wedge 158 and base 128 as shown in Figs. 6 and 9. When knob 153 is actuated to move shaft 151 up or down in slot 152 the knife edge tip of wedge 157 on carriage 154 rides over the corresponding tip of wedge 158 on spring-pressed plunger 159 so that the upward pressure of wedge 158 on wedge 157 always holds shaft 151 in one or the other extreme position at the top or bottom of slot 152. Shaft 151 extends through a slot in lever 162 which is pivoted at 163 to support 126 as shown in Fig. 9. Lever 162 is fixed to fork 164 which straddles the reduced central shank of the spool-shaped clutch 145 of jack shaft 141; hence vertical movement of shaft 151 by knob 153 causes lever 162 to rotate on its pivot 163 thereby rocking fork 164 which moves clutch 145 and jack shaft 141 lengthwise in hollow shaft 125 for a distance equal to the length of slot 147 and in a direction depending upon whether knob 153 is moved up or down. When knob 153 is in the "up" position, with shaft 151 engaging the upper end of slot 152 as shown in Figs. 6 and 9, fork 164 forces clutch 145 and jack shaft 141 toward the left as viewed in Fig. 9, thereby disen-

gaging pin 143 of jack shaft 141 from slot 144 in the hub of worm wheel 132 and disconnecting the reduction gears of motor 139 from shaft 125. When the parts are in this position worm 150 on shaft 151 meshes with worm wheel 149 on shaft 125, enabling shaft 125, dial 130 and condenser 131 to be rotated manually by knob 153. On the other hand, when knob 153 is in the "down" position, with shaft 151 engaging the lower end of slot 152, worm 150 is disengaged from worm wheel 149 and pin 143 on jack shaft 141 is engaged in slot 144 in the hub of worm wheel 132, enabling motor 139 to rotate shaft 125, dial 130 and condenser 131 through the reduction gears described above. If pin 143 does not exactly register with slot 144 when knob 153 is being lowered, it is simply necessary to rotate said knob slightly in one direction or the other until pin 143 enters slot 144 since it is impossible to lower knob 153 until this condition prevails. Shaft 151 also actuates the elongated central blade or contact finger 165 of a two-way switch having opposite short contact fingers 166 and 167 as shown in Figs. 6, 9 and 11. The purpose of this switch will be described later; for the present it is noted that when shaft 151 is raised out of engagement with contact finger 165 said finger engages finger 166, whereas when shaft 151 is depressed it forces finger 165 into engagement with finger 167.

Shaft 125 carries a plurality of cam discs 170 each of which contains a peripheral slot 171 as shown in Figs. 9, 10 and 11. Cooperating with each disc 170 is an elongated contact finger 172 having an insulated roller 173 bearing on the peripheral edge of said disc. Each roller finger 172 is mounted between and insulated from an upper contact finger 174 and a lower contact finger 175, all of said banks of contacts 172, 174 and 175 being mounted on a horizontal plate 176 secured to end supports 126 and 127 as best shown in Fig. 9. Each disc 170 with its associated contact fingers 172, 174 and 175 is allotted to and represents an individual radio broadcasting station. In the embodiment shown in the drawings there are five discs 170 and five banks of contact fingers 172, 174 and 175, representing a five-station set, which corresponds with the number of contact fingers 25—29 associated with the selector drum of Fig. 1. The various roller fingers 172 are connected by individual conductors 33—37 to the respective contact fingers 25—29 of the selector drum mechanism as shown in Figs. 1, 9 and 11. The upper contact fingers 174 are all connected to a common conductor 178 while the lower contact fingers 175 are all connected to another common conductor 179 as indicated in Fig. 11. To simplify the description and avoid confusion, however, Fig. 11 is wired for only one complete radio broadcast station, to wit, the station allotted to contact finger 25 in the selector drum mechanism of Fig. 1. It will be evident that when the roller 173 of any contact finger 172 rests on the peripheral edge of its cam disc 170, that finger 172 will engage its adjacent upper contact finger 174; and when any roller 173 falls into the slot 171 in the periphery of its cam disc 170, the contact finger 172 carrying such roller will flex downwardly into engagement with its adjacent lower contact finger 175. The cam discs 170 are secured to control shaft 125 by individual clamps 180 which are carried by said discs and are clamped to said shaft by screws 181 as shown in Figs. 9 and 10. By loosening screws 181 any disc 170 may be rotated to any angular position on shaft 125. The accurate selection of the signal channel or wave length of any given radio station is accomplished by first turning knob 153 by hand until dial 130 arrives at the desired station; shaft 125 is locked or held at this setting, after which the disc 170 is slowly rotated by hand until the roller 173 of its associated contact finger 172 falls into the slot 171 on the peripheral edge of said disc, whereupon said disc is locked to shaft 125 by tightening screw 181 in clamp 180. In this manner each disc 170 is adjusted and clamped on shaft 125 in a particular angular position corresponding to a particular setting of dial 130 and tuning condenser 131. Once a disc 170 is set in this manner, no further adjustment is necessary. The next step in adjusting the apparatus preparatory to use is to trace the leads 33—37 of the various roller fingers 172 back to the respective contact fingers 25—29 of the selector drum mechanism of Fig. 1; then, upon inserting the finger in any finger hole 51 of calling dial 50 and rotating said dial as far as the finger piece 52, ram 38 will push a contact segment 19 into position opposite one of the fingers 25—29, whereupon that particular finger hole 51 is labeled with the letters of the radio station allotted to the finger 25, 26, 27, 28 or 29 opposite which the contact segment 19 came to a stop. This procedure is repeated until all the finger holes 51 of dial 50 are properly traced and labeled. Of course all such adjustments are usually made in advance or at the time the radio set is installed in the home or other place of use, although they may be varied from time to time by the user if occasion requires.

The electric operating circuit for the mechanism described above includes conductors 56 and 57 which in the present instance are connected by plug 183 to any suitable source of alternating current such as a house lighting system. Branches of conductors 56 and 57, shown in broken lines at the top of Fig. 11, are connected to the electric clock 55 in Fig. 1 from which it will be seen that clock 55 runs continuously day and night provided plug 183 is connected to the current outlet. The energizing circuit of the radio set itself (radio tubes, etc.) extends from conductor 56, through contact 184 and armature of electromagnet 185, conductor 186, and thence through the radio set to conductor 57 as illustrated in Fig. 11. Connected across supply conductors 56—57 is a low voltage transformer 187 the purpose of which is to reduce the line voltage to, say, 24 volts, to operate electromagnets 185 and 188, etc., as will now be described. As shown in the drawings, electromagnets 185 and 188 are clapper-type contactor magnets and are suitably mounted on the framework which supports the banks of contact fingers 172, etc. in Fig. 9. Electromagnet 189 is controlled by the armature and contact 190 of electromagnet 188 as hereinafter described. The armature 191 of electromagnet 189 is pivoted at 192 and carries an arcuate brake shoe 193 adapted to engage a cylindrical drum 194 carried by shaft 138 of motor 139. When magnet 189 is energized, it attracts its armature 191 and thereby disengages brake shoe 193 from drum 194, permitting motor 139 to rotate its shaft 138 and associated gears controlling dial 130 and condenser 131. The instant magnet 189 is deenergized, however, spring 195 returns armature 191 to normal the position in which brake shoe 193 engages drum 194. As will be explained below, motor 139 is deenergized at the same time as magnet 189, but the prompt application of the brake to the motor shaft is nevertheless highly desirable as it prevents the

momentum of the motor, etc. from rotating condenser 131 beyond the exact setting required for perfect tuning of a given radio station.

When the rotating selector drum of Fig. 1 arrives at a point where a contact segment 19 engages one of the contact fingers 25—29, for example contact finger 25, magnet 188 of Figs. 9 and 11 will be energized over a circuit extending from the low voltage side of transformer 187 through conductor 198, contact fingers 165 and 167 (which are always held closed by shaft 151 during automatic operation of the set), conductor 32, metal chassis of the control drum in Fig. 1, contact segment 19, contact finger 25, conductor 33, roller finger 172 in Figs. 9 and 11, associated upper contact finger 174 (which is closed since roller 173 is normally riding on the periphery of disc 170), conductor 178, through winding of magnet 188, and thence by conductor 199 to the other terminal on the low voltage side of transformer 187. Magnet 188 thereupon attracts its armature, closing contact 190 which simultaneously connects motor 139 and brake magnet 189 to supply conductors 56—57. Since magnet 189 releases brake shoe 193 from drum 194, the motor 139 can rotate only when said motor and magnet are energized at the same time. The armature of magnet 188 preferably carries a finger 197 which engages the armature of magnet 185 and causes said armature to close its contact 184 thereby closing the radio set energizing circuit and warming up the tubes preparatory to the electrical operation of relay 185 which will be described presently. Motor 139 now drives control shaft 125 until roller 173 of contact finger 172 falls into slot 171 in disc 170. When this occurs, finger 172 disengages upper contact finger 174, thereby deenergizing magnet 188 and consequently stopping motor 139 and applying the brake 193 which prevents the motor and associated mechanism from coasting or carrying condenser 131 past the desired point of tuning. At the instant roller finger 172 disengages upper contact finger 174 it engages lower contact 175, thereby energizing magnet 185 which closes the energizing circuit of the radio set through contact 184 as described above. The radio set thereupon delivers the desired preselected radio program. It will be evident from the foregoing description that a single magnet 185 and a single magnet 188 are all that are required to handle any number of broadcast stations; and it will further be evident that the cycle of operations just described is the same for all broadcast stations except, of course, that each station is allotted to its own individual cam disc 170 and its own individual contact segment 19 and cooperating contact finger 25—29 on the selector drum mechanism of Fig. 1. When motor 139 rotates control shaft 125 and cam discs 170, as described above, various rollers 173 on contact fingers 172 may fall into the slots 171 of their respective discs 170 before the roller 173 of the desired preselected station reaches its slot 171; but of course control shaft 125 and discs 170 will continue to rotate until one of the roller fingers 172, in breaking contact with its upper finger 174, breaks the energizing circuit of magnet 188 previously established through a contact segment 19 and one of the associated contact fingers 25—29.

As long as a contact segment 19 remains in engagement with one of the contact fingers 25—29, magnet 185 will remain energized and the radio set will continue to deliver the program selected in the manner described above. The length of each program is fifteen minutes, after which the continuously rotating selector drum of Fig. 1 will carry contact segment 19 beyond its associated contact finger 25—29. When this happens, magnet 185 will be deenergized and the radio set turned off since its energizing circuit will be broken at contact 184 of magnet 185. If the next fifteen minute period happens to be assigned to the same identical broadcast station as the preceding period, the energizing circuit of magnet 185 will be instantly reestablished when the succeeding contact segment 19 engages its contact finger 25—29 because contact fingers 172 and 175 of cam disc 170 will still be engaged due to the fact that roller 173 of finger 172 will still rest in the slot 171 of said disc; hence the same broadcast station as that previously heard will continue to play without interruption. On the other hand, if the next program happens to be scheduled from another broadcast station, whether it follows immediately after the last program or later in the day, the mechanism functions to tune in the proper station as previously described.

It has already been explained that operating knob 153 and shaft 151 of Fig. 9 must be in raised position at the upper end of slot 152 in order to operate the set by hand, that is, in order to actuate dial 130 and condenser 131 by rotating knob 153. When knob 153 and shaft 151 are in such raised position the shaft is out of contact with finger 165 (Figs. 9 and 11) and said finger 165 therefore engages finger 166, thereby energizing magnet 185 over a circuit extending from the low voltage side of transformer 187, through conductor 198, contact fingers 165 and 166, conductor 200, winding of magnet 185, to the other terminal on the low voltage side of transformer 187. The energizing circuit of the radio set is therefore completed at contact 184 of magnet 185 as previously described and any desired station may be tuned in simply by rotating knob 153 in the usual manner. It is of course understood that the set may be disconnected at any time either by pulling plug 183 out of its socket or by operating a suitable master switch which may be provided for that purpose. Ordinarily, however, the set will be permanently connected to the lighting circuit or other source of current by plug 183 even if the set is not used continuously since in such case the only power consumption is by the electric clock 55 which draws very little current.

It has been explained that lamp 9 adjacent window 8 in Fig. 1 is lighted when contacts 116 and 117 are closed by pulling out knob 78 at the front of the cabinet. The energizing circuit of this lamp contains a resistance unit 201 (Fig. 11) for the purpose of reducing the transformed voltage to say 2.5 volts for feeding this lamp. The lamp circuit extends from the low voltage side of transformer 187, through resistance 201, conductor 119, lamp 9, conductor 118, contacts 117 and 116, chassis of the control drum, conductor 32, contact fingers 167 and 165, to the other terminal on the low voltage side of transformer 187. Of course if knob 153 and shaft 151 are in raised position at this time, contact fingers 167 and 165 will be disengaged and lamp 9 will not be lighted. This will serve to remind the operator to depress knob 153 to prepare the set for automatic operation; and thereafter, when the selector drum of Fig. 1 is loaded with the desired programs, automatic operation can proceed without further adjustment as soon as lamp 9 is extinguished by pushing back knob 78 in Fig. 1.

Operation

In describing the operation of the set it is assumed that the cam discs 170 of Fig. 9 are adjusted to correspond with various predetermined settings of condenser 131 so that, whenever a roller 173 is seated in the slot 171 of a disc, the condenser 131 will be in the exact position required to tune in a desired station; and it is also assumed that the various finger holes 51 of calling dial 50 in Fig. 1 are appropriately labeled to correspond with the setting of discs 170. Of course there is no objection to leaving one or more discs 170 unassigned, in which case a corresponding number of finger holes 51 of calling dial 50 will be left blank, but no other change or adjustment in the apparatus is required.

To set a day's program from the local newspapers, the knob 78 is pulled out the entire length of its travel which equals the length of the slot 83 in shaft 76. This disconnects the selector drum from electric clock 55 and enables said drum to be rotated manually by turning knob 78. It also lights lamp 9 at window 8, indicating that the process of selecting the program may begin. The knob 78 is accordingly turned until the mark on scale 7, representing the time of the desired program, is directly opposite the pointer 48 in window 8. The operator then rotates calling dial 50 up to the finger hole 51 assigned to the desired station, causing ram 38 to force the adjacent contact segment 19 into alignment with one of the contact fingers 25—29 as previously described. The calling dial is then released and returns to normal position while the contact segment 19 is locked in its new position by its associated catch 23.

After a station is dialed, the knob 78 is turned to the next desired fifteen minute mark and the operator dials the next station which may, of course, be the same or different from the previously selected station. This operation is continued until the entire program is absorbed. On completion, the knob 78 is pushed in to connect the selector drum with electric clock 55. The angular position of the selector drum at this time will correspond with the time indicated on the face of clock 55 since otherwise the tapered pin 61 of shaft coupling 62 would not engage the tapered hole in the hub 60 of gear 59. As soon as knob 78 is pushed in the full length of its travel, and the selector drum is thereby connected to electric clock 55, lamp 9 is extinguished, thereby indicating that the set is ready to function automatically to deliver the preselected radio programs.

If the listener desires for any reason to shut off a program while it is being played, all that is necessary is to depress lever 101 at the front of the cabinet, thereby actuating trip finger 106 (Fig. 2) which allows contact segment 19 to return to its normal position and therefore shuts off the program. Lever 101 is also actuated in this manner if an error in dialing occurs when setting the program.

In the course of a day the operator may wish to tune in some station, either local or remote, which is not represented on calling dial 50 and hence has not been selected for automatic operation. Any such station may be obtained simply by raising knob 153 (Fig. 9) and rotating said knob by hand until the desired station appears on tuning dial 130. Thereafter, automatic operation will be resumed as soon as knob 153 is depressed since the selector drum of Fig. 1 continues its rotation and therefore keeps in step with clock 55 even when knob 153 is raised for manual operation.

The set continues to operate automatically until the selector drum of Fig. 1 completes its revolution and all the contact segments 19 return to normal position, indicating that the day's programs are ended.

Semi-automatic and remote control

The apparatus described above may be modified for semi-automatic operation as well as for remote control if desired. For semi-automatic operation the knob 153, switch 165—167 and associated manual control mechanisms of Fig. 9 are omitted and replaced by a toggle switch 203 which is diagrammatically illustrated in Fig. 12 and may be mounted in the position now occupied by the guide slot 152 in Fig. 9. For manual operation, switch 203 is rocked slightly to the right as viewed in Fig. 12, thereby causing contact blade 204 to engage blade 205. As these blades are connected, respectively, to conductors 198 and 179 of Fig. 11, their engagement will cause the radio set to be operated over a circuit similar to that previously described. Then, by rocking switch 203 still further to the right, blade 205 is brought into engagement with blade 206 which is connected to conductor 178 of Fig. 11, this operation completing the energizing circuit of motor 139 which rotates control shaft 125 and condenser 131 until the desired station is tuned in and contact blades 205—206 are disengaged by rocking switch 203 slightly to the left in Fig. 12. All tuning can be accomplished by rotating motor 139 in one direction although additional switch contacts may be provided for reversing motor 139 if desired. For the sake of simplicity, however, I have shown only the connections required to rotate the motor in one direction. For automatic operation, switch 203 is rocked to the left in Fig. 12, thereby establishing contact between blades 207 and 208. Blade 207 is connected to conductor 198 while blade 208 is connected to conductor 32 in Fig. 11; hence the engagement of these blades conditions the system for full automatic operation in the same manner as does the engagement of contact fingers 165 and 167 whose place they take.

To make the set operable by remote control I provide a socket 210 which may be conveniently mounted on the front panel 1, and a portable unit comprising plug 211, a suitable length of cable 212 and a box 213 containing a potential meter 214 calibrated in kilocycles and a toggle switch 215 which is a duplicate and takes the place of toggle switch 203 described above. It will thus be seen that plug 211, cable 212 and toggle switch 215 merely extend the toggle switch circuit previously described. However, in order to give the operator an "answer back", which will let him known what station is being selected, a suitable standard high resistance potentiometer 216 is provided, having its contact arm 217 secured to the control shaft 129 of condenser 131 as shown in Figs. 9 and 12. The terminals of potentiometer 216 are connected by conductors 218 and 219 to a suitable "B" battery or other source of direct current from the radio set. The potentiometer is likewise connected to meter 214 by leads 220 and 221 to and from socket 210 as shown in Fig. 12. Now by inserting plug 211 into socket 210, and by moving toggle switch 215 in the manner previously described in con-

nection with toggle switch 203, motor 139 will rotate control shaft 129 carrying the contact arm 217 of potentiometer 216. This causes contact arm 217 to vary the drop in potential across the leads to meter 214 according to the position of arm 217 and control shaft 129. Since meter 214 is calibrated in kilocycles instead of volts, the reading thereon will identify the station which is being tuned in by remote control. One prong 222 of plug 211, and its cooperating hole 223 of socket 210, are made larger than the other prongs and holes in order to avoid accidental connection of dissimilar leads when plugging in.

Among other advantages of my radio program selector may be mentioned its simplicity and accuracy of operation. The preselection of programs, for example, involves a simple dialing operation with which the public is already familiar through the common use of automatic telephones. Once the program is set, the operation is automatic even to the restoration to normalcy after the program is completed. This eliminates many bewildering appliances to be disconnected or things to be remembered after the program is completed, as well as in setting same. Furthermore, the ease with which the cam discs of Figs. 9 and 10 may be set for any station enables the set to be used with equal flexibility in all localities.

It will be evident that various changes may be made in the details of construction and mode of operation described herein without departing from the scope and spirit of the invention as defined in the appended claims.

The invention claimed is:

1. In combination in a radio receiver, an energizing circuit, a tuning element, a control member comprising a rotatable cam shaft for setting said tuning element to selected radio stations, a plurality of cams carried by said cam shaft, means for setting said cams to correspond with predetermined positions of said tuning element, a motor for rotating said cam shaft, a brake for said motor, a magnet for operating said motor and releasing said brake, a second magnet controlling said radio energizing circuit, operating circuits for said magnets, pairs of contact members adjacent each of said cams, one contact member of each pair being connected to the operating circuit of one magnet and the other contact member of each pair being connected to the operating circuit of the other magnet, a contact finger between each pair of contact members actuated by the adjacent cam and adapted to engage one or the other contact member according to the angular position of the cam, a time controlled selector adapted to be set to a predetermined sequence of stations, and means controlled by said selector for selectively completing the operating circuits of said first and second magnets through said contact fingers according to the angular position of said cams.

2. In combination in a radio receiver, an energizing circuit, a tuning element, a control member comprising a rotatable cam shaft for setting said tuning element to selected radio stations, a plurality of cams carried by said cam shaft, means for setting said cams to correspond with predetermined positions of said tuning element, a motor for rotating said cam shaft, a brake for said motor, a magnet for operating said motor and releasing said brake, a second magnet controlling said radio energizing circuit, operating circuits for said magnets, pairs of contact members adjacent each of said cams, one contact member of each pair being connected to the operating circuit of one magnet and the other contact member of each pair being connected to the operating circuit of the other magnet, a contact finger actuated by each of said cams for selectively engaging the adjacent contact members according to the angular position of the cam, a time controlled selector having a plurality of contact segments, means for setting said contact segments in a plurality of positions representing individual radio stations, and means controlled by said contact segments for selectively completing the operating circuits of said first and second magnets through said contact fingers at predetermined times according to the angular position of said cams.

3. In combination in a radio receiver, an energizing circuit, a tuning element, a control member comprising a rotatable cam shaft for setting said tuning element to selected radio stations, a plurality of cams carried by said cam shaft, means for setting said cams to correspond with predetermined positions of said tuning element, a motor for rotating said cam shaft, a brake for said motor, a clutch for disconnecting said cam shaft and tuning element from said motor, means for operating said clutch and for rotating said tuning element by hand, a magnet for operating said motor and releasing said brake, a second magnet controlling said radio energizing circuit, operating circuits for said magnets, pairs of contact members adjacent each of said cams, one contact member of each pair being connected to the operating circuit of one magnet and the other contact member of each pair being connected to the operating circuit of the other magnet, a contact finger actuated by each of said cams for selectively engaging the adjacent contact members according to the angular position of the cam, a time controlled selector having a plurality of contact segments, means for setting said contact segments in a plurality of positions representing individual radio stations, and means controlled by said contact segments for selectively completing the operating circuits of said first and second magnets through said contact fingers at predetermined times according to the angular position of said cams.

4. In a radio program selector, a rotatable drum, means for driving said drum at a definite speed, a clutch for disconnecting said drum from said driving means, a plurality of equally spaced contact segments disposed about the periphery of said drum and adapted to be adjusted thereon in a direction transverse to the plane of rotation, means for adjusting said contact segments transversely of said drum, catches pivoted on said drum for holding said contact segments in adjusted position, means for returning said contact segments to normal position when released by said catches, a plurality of contact members adjacent said drum for engagement with the adjusted contact segments, a tripping device beyond said contact members for tripping said catches to return said contact segments to normal position on said drum, means for actuating said clutch to disconnect said drum from said driving means, means controlled by said clutch actuating means for moving said contact members and tripping device out of the path of said drum, and means for rotating said drum independently of said driving means.

5. In a radio program selector, a rotatable drum, means for driving said drum at a definite speed, a clutch for disconnecting said drum from

said driving means, a plurality of equally spaced tubes disposed about the periphery of said drum at right angles to its plane of rotation, spring-actuated contact segments adjustable longitudinally of said tubes, catches pivoted on said drum adjacent said tubes for holding said contact segments in adjusted position, a ram mounted at right angles to the plane of rotation of said drum in the path of said tubes and adapted to move longitudinally in said tubes to actuate said contact segments, means for actuating said ram to move the adjacent contact segment a predetermined distance longitudinally of its tube, a plurality of contact members adjacent said drum for engagement with the adjusted contact segments, a tripping device beyond said contact members for tripping said catches to return said contact segments to normal position under the action of said springs, means for actuating said clutch to disconnect said drum from said driving means, means controlled by said clutch actuating means for moving said contact members and tripping device out of the path of said drum, and means for rotating said drum independently of said driving means.

6. In a radio program selector, a rotatable drum, means for driving said drum at a definite speed, a clutch for disconnecting said drum from said driving means, a plurality of equally spaced tubes containing longitudinal slots disposed about the periphery of said drum at right angles to its plane of rotation, rods slidable in said tubes and having a plurality of spaced notches facing said slots, springs acting on said rods to hold them nested in said tubes, contact segments carried by said rods outwardly of said slots, spring actuated catches pivoted on said drum adjacent said tubes and flexed to engage the notches in said rods to hold said rods and contact segments in adjusted position in said tubes, a ram mounted at right angles to the plane of rotation of said drum in the path of said tubes and adapted to move longitudinally in said tubes to actuate said rods, means for actuating said ram to move the adjacent rod and contact segment a predetermined distance longitudinally of the tube, a plurality of contact members adjacent said drum for engagement with the adjusted contact segments, a tripping device beyond said contact members for tripping said catches to return said rods and contact segments to normal position under the action of said springs, means for actuating said clutch to disconnect said drum from said driving means, means controlled by said clutch actuating means for moving said contact members and tripping device out of the path of said drum, and means for rotating said drum independently of said driving means.

7. In a radio program selector, a rotatable drum, means for driving said drum at a definite speed, a clutch for disconnecting said drum from said driving means, a plurality of equally spaced tubes containing longitudinal slots disposed about the periphery of said drum at right angles to its plane of rotation, rods slidable in said tubes and having a plurality of spaced notches facing said slots, springs acting on said rods to hold them nested in said tubes, contact segments carried by said rods outwardly of said slots, spring-actuated catches pivoted on said drum adjacent said tubes and flexed to engage the notches in said rods to hold said rods and contact segments in adjusted position in said tubes, a ram mounted at right angles to the plane of rotation of said drum in the path of said tubes and adapted to move longitudinally in said tubes to actuate said rods, a rack carried by said ram, a rotatable dial having a pinion engaging said rack to actuate said ram and thereby move the adjacent rod and contact segment a predetermined distance longitudinally of the tube according to the arc of rotation of said dial, a plurality of contact members adjacent said drum for engagement with the adjusted contact segments, a tripping device beyond said contact members for tripping said catches to return said rods and contact segments to normal position under the action of said springs, means for actuating said clutch to disconnect said drum from said driving means, means controlled by said clutch actuating means for moving said contact members and tripping device out of the path of said drum, and means for rotating said drum independently of said driving means.

8. In combination in a radio receiver, a tuning element, means for setting said tuning element to selected radio stations, a time controlled selector mechanism comprising a rotatable element having mounted thereon and revoluble therewith a multiplicity of selector members, each secured to said rotatable element and movable axially and parallel to the axis of rotation thereof, means for moving each of said selector members into a plurality of differentially selectable positions comprising an element movable axially to variable extents toward and into contact with one of said selector members to move said member into selected positions, a fixed support for said element, manually controlled means to cause said element to move said selector member into any selected position with a single manual motion, means to move each selector member into line with said element, and means controlled by said selector mechanism for operating said setting means at predetermined times to tune the receiver to said stations in predetermined sequence.

9. In combination in a radio receiver, an energizing circuit, a tuning element, a control member for setting said tuning element to selected radio stations, a time controlled selector mechanism comprising a rotatable element having mounted thereon and revoluble therewith a multiplicity of selector members, each secured to said rotatable element and movable axially and parallel to the axis of rotation thereof, means for moving each of said selector members into a plurality of differentially selectable positions comprising an element movable axially to variable extents toward and into contact with one of said selector members to move said member into selected positions, a fixed support for said element, manually controlled means to cause said element to move said selector member into any selected position with a single manual motion, means to move said selector member into line with said element, and means controlled by said selector mechanism for energizing said circuit and for operating said setting means at predetermined times to tune the receiver to said stations in predetermined sequence.

10. In combination in a radio receiver, an energizing circuit, a tuning element, a time controlled selector having a plurality of contacts of a length corresponding to the duration of a radio program comprising a rotatable element having mounted peripherally thereon, permanently secured to and revoluble therewith a multiplicity of selector members, each movable axial-

ly and parallel to the axis of rotation of said rotatable element, means for moving each of said selector members into a plurality of differentially selectable positions to control said contacts and to move the same selectively into a plurality of positions representing individual radio stations, said means comprising an element movable axially to variable extents toward and into contact with one of said selector members to move said member into selected positions, a fixed support for said element, manually controlled means to cause said element to move said selector member into any selected position with a single manual motion, and means to move each selector member into line with said element, means controlled by said contacts for setting said tuning element to a preselected station to energize said circuit, and means controlled by said contacts for de-energizing said circuit.

11. A mechanism as defined by claim 8 further comprising means operative immediately upon the completion of a program to return said selector members to normal position.

12. A mechanism as defined by claim 9 further comprising means operative immediately upon the completion of a program to return said contacts to normal position.

13. In combination in a radio receiver an energizing circuit, a tuning element, a control member for setting said tuning element to selected radio stations, a time controlled selector rotor having mounted thereon, and revoluble therewith, a multiplicity of selector members each permanently secured to said rotor and movable axially and parallel to the axis of rotation thereof, each of said selector members representing a division of time, means for moving each of said selector members into a plurality of differentially selectable positions comprising an element movable axially to variable extents toward and into contact with one of said selector members to move said member into selected positions, a fixed support for said last element, manually controlled means to cause said last element to move said selector member into any selected position with a single manual motion, and means to move each selector member into line with said element, a series of contact fingers adapted to be engaged at times by selected selector members and thereby to bring in at any time and in desired sequence a series of stations, and means controlled by said selector for selectively operating said control member and for energizing said circuit according to the position of said tuning element.

14. In combination in a radio receiver, an energizing circuit having branches representing different radio stations, a tuning element, a control member for setting said tuning element to selected radio stations, a motor for operating said control member, a time-controlled selector mechanism comprising a rotatable drum having mounted thereon peripherally, in parallelism with the axis of said drum, a multiplicity of lengthwise adjustable selector rods each provided with a contact and each representing a unit of operating time, a manual setting device in fixed alignment with a peripheral axial position common to an extension of the axis of each of said rods when brought into registry with said device by rotation of said drum for moving each of said selector rods into a plurality of differentially selectable positions and for connecting its contact into one of said branch circuits thereby to bring in a predetermined sequence of stations, said device comprising an element movable axially to variable extents toward and into contact with one of said selector rods to move said rod into selected position, manually controlled means to cause said element to move said selector member into any selected position with a single manual motion, means controlled by said selector for selectively operating said motor and energizing said circuit according to the position of said tuning element, and means for disconnecting said control member from said motor and for setting said tuning element by hand.

15. In combination with a radio receiver, a rotatable drum, means for driving said drum at a definite speed, means for disconnecting said drum from said driving means, a plurality of contact segments permanently secured to said drum about the periphery thereof and movable axially and parallel to the axis of rotation, means for moving each of said contact segments into a plurality of differentially selectable positions comprising an element movable axially to variable extents toward and into contact with one of said contact segments to move said segment into selected positions, a fixed support for said element, manually controlled means to cause said element to move said segment into any selected position with a single manual motion, means to move each segment into line with said element by rotating said drum independently of said driving means, means for holding said segments in adjusted position and for returning them to normal position when released, a plurality of contact members adjacent said drum for engagement with the adjusted segments, and means for releasing said contact segments.

16. A radio receiver as defined in claim 9, including a motor for operating said control member, a brake for said motor, a magnet for operating said motor and releasing said brake, a second magnet controlling said radio energizing circuit, said means controlled by said selector for selectively energizing said first and second magnets according to the position of said tuning element.

17. A radio receiver as defined in claim 9, said control member comprising a rotatable cam shaft for setting said turning element to selected radio stations, a plurality of cams carried by said cam shaft, means for setting said cams to correspond with predetermined positions of said tuning element, a motor for rotating said cam shaft, a brake for said motor, a magnet for operating said motor and releasing said brake, a second magnet controlling said radio energizing circuit, operating circuits for said magnets, contacts in said operating circuits, means controlled by said cams for selectively operating said contacts according to the angular position of said cams, said means controlled by said selector for selectively completing the operating circuits of said first and second magnets through their respective cam-operated contacts according to the angular position of said cams.

SAMUEL SPAGNOLA.