

Oct. 24, 1939.

D R. DE TAR

2,177,479

PROGRAM DEVICE

Filed June 7, 1938

2 Sheets-Sheet 1

Fig. 1.

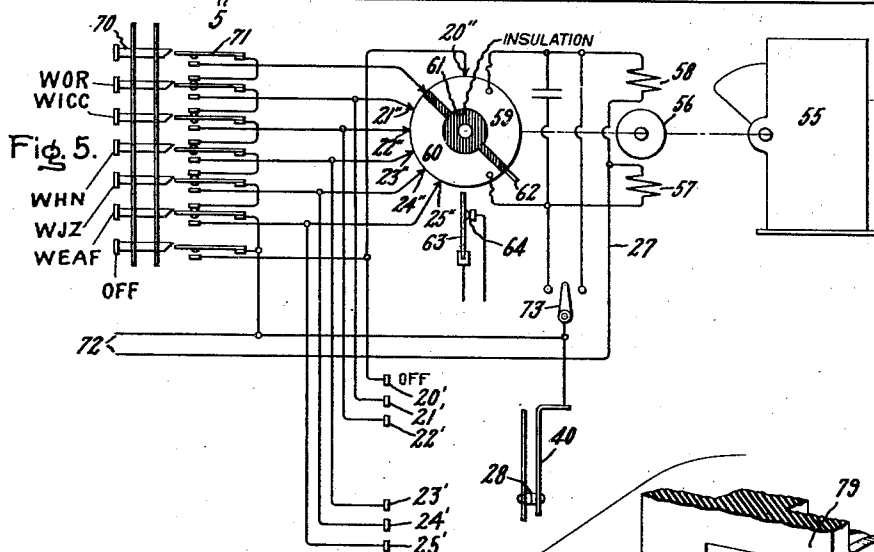
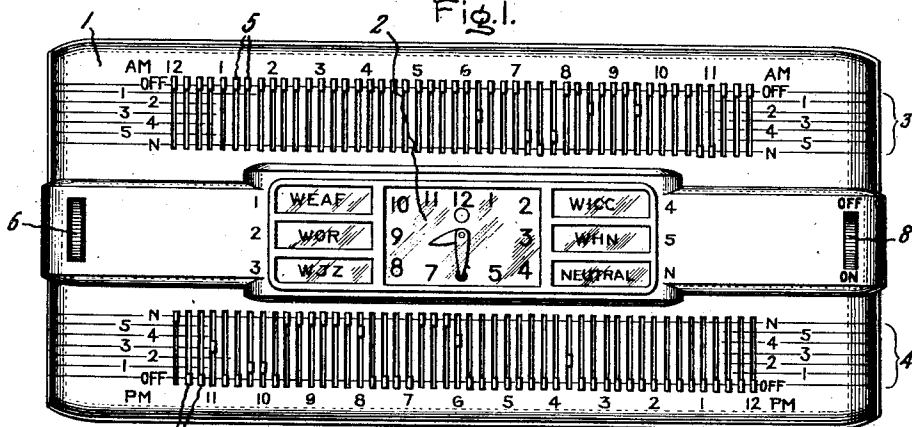
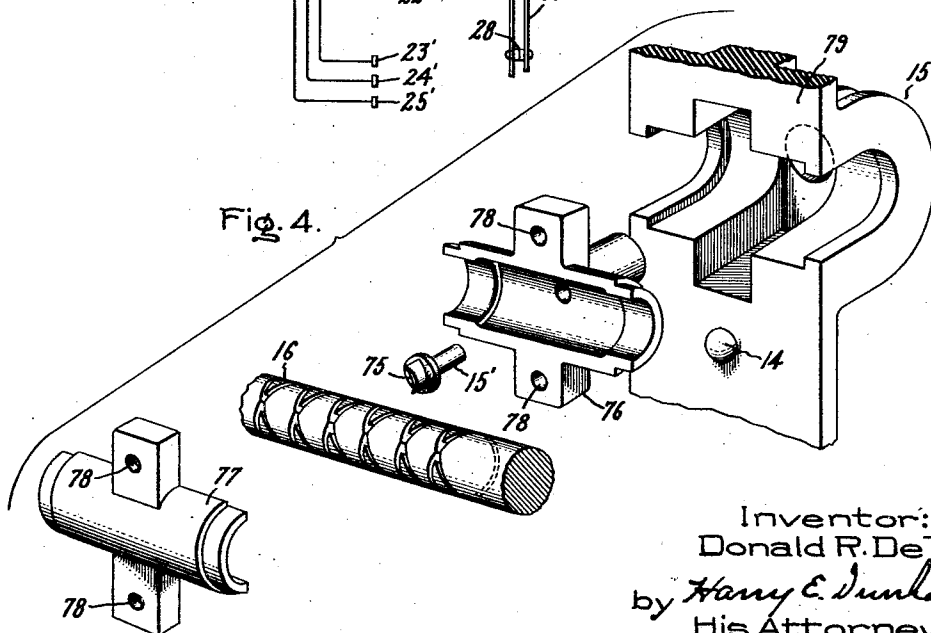


Fig. 4.



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His Attorney.

Oct. 24, 1939.

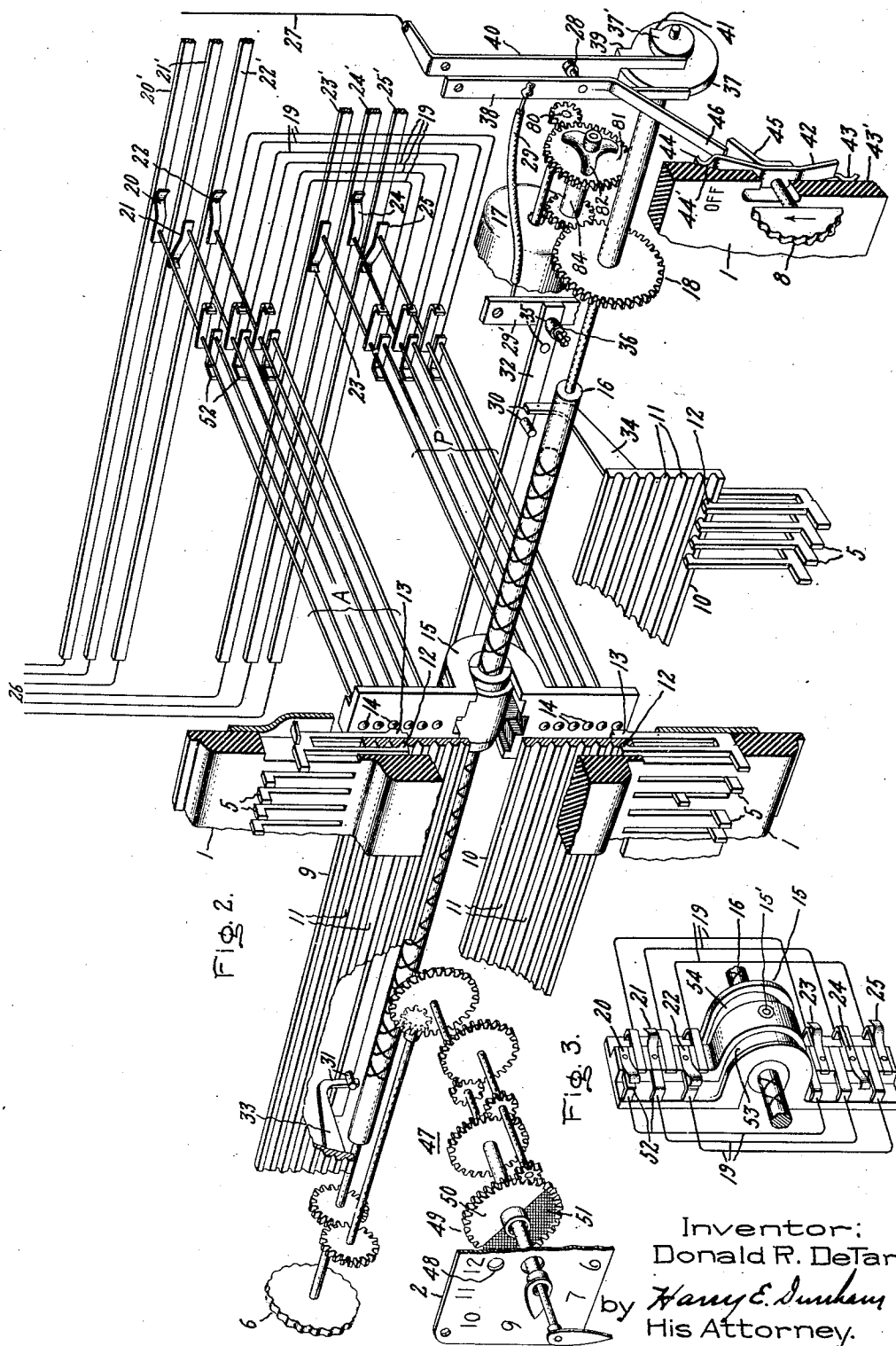
D. R. DE TAR

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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,177,479

PROGRAM DEVICE

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General Electric Company, a corporation of New
York

Application June 7, 1938, Serial No. 212,275

14 Claims. (Cl. 200—37)

My invention relates to program devices, and particularly to devices for use in connection with radio receivers to effect desired tuning thereof in accordance with a prearranged schedule.

It has for one of its objects to provide a program device which may be readily applied to radio receivers of conventional construction and without alteration of the receivers.

Another object of the invention is to provide such a program device, which is of simple construction, economical to manufacture, and which is readily mountable in the cabinet of the radio receiver with which it is to be used.

A still further object of the invention is to provide such a program device which may be mounted in the radio cabinet without detracting from the beauty of the cabinet and which lends itself to pleasing cabinet designs.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, both as to its organization and method of operation together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings in which Fig. 1 represents a dial, or face plate, for use in connection with my invention; Fig. 2 represents in somewhat exploded way, the mechanical mechanism thereof; Figs. 3 and 4 represents certain details and Fig. 5 indicates the circuit arrangement employed.

Referring to Fig. 1 of the drawings, I have shown therein a face plate 1, at the middle of which is mounted a clock 2. Two groups of parallel vertical slots in the face plate 1 are indicated at 3 and 4, one of these groups being, for convenience and appearance, arranged above the clock, and the other below the clock, the group 3 corresponding to a certain period of the day as, for example, the twelve hours of the morning, and the group 4 corresponding to a different period of the day as for example, the twelve hours of the afternoon. Each slot corresponds to a certain interval of its respective period. Since, as shown, there are 48 slots in each group, each slot corresponds to a fifteen minute interval. In each slot is arranged a slider 5, each of these sliders being positionable longitudinally of the respective slot and being arranged, as will presently be described, to effect the selection of a desired program, or wavelength, in accordance with the position in the slot which it occupies at the time to which the particular slider corresponds. For example, with the sliders of the

A. M. group 3 in the extreme upper position, which is designated by the letters "Off", or with any of those of the P. M. group 4 in the extreme lower position which is similarly designated, the radio receiver is automatically turned off by the program device. If any of the sliders 5 be in any one of five other positions as indicated by the reference characters 1, 2, 3, 4, and 5 indicated at the right, and at the left, of the two groups of slots, the receiver is tuned to a selective broadcasting station at the times to which the respective sliders correspond. If the sliders of the P. M. group 4 be in the upper position, which positions are designated "N" or "Neutral", then no operation is effected at the particular time corresponding to the respective sliders which are so positioned.

These reference characters may also appear on the face plate 1 at the right and at the left of the clock 2, adjacent to the call letters of the particular broadcasting station to be received.

Thus, with the sliders in the position indicated in the A. M. group 3, the receiver is off during the hours from 12:00 to 6:15 as indicated by the numerals indicated along the top of the group and by the indicated position of the sliders. At 6:15 A. M. it is tuned to station WJZ. Station WJZ is heard from 6:15 to 6:30 when the receiver is again turned off and remains turned off until 7:15 when it is automatically tuned to station WHN. It remains tuned to station WHN until 8:00 o'clock when it is again turned off and remains turned off until 8:30 when it is tuned to WOR, and so on, throughout the rest of the twelve hour period. During the afternoon hours, the schedule is determined by the sliders of the lower group, the slider corresponding to 12:00 o'clock noon being at the right and that corresponding to 11:45 P. M. being at the left.

At the left of the drawing, I have indicated a control handle 6 in the form of a knurled disk which is used to set the clock. At the right is a similarly appearing control handle 8 which is movable upwardly to disconnect the program device from the receiver, or downwardly to connect it thereto.

The mechanism whereby the desired control operations are effected is illustrated in detail in Fig. 2 where I have indicated a fragment of the face plate 1 near the center of the drawing, the remainder being broken away to expose the mechanical elements at the rear of the face plate. The sliders 5, in addition to being mounted in the face plate 1 are of conducting material and of an elongated U-shape. The legs of the U

are arranged to straddle and to grip conducting plates 9 and 10, the sliders of the A. M. period gripping the plate 9 and the sliders of the P. M. period gripping the plate 10. These plates are of conducting material and are provided with grooves 11 into which a prong or detent 12 on one leg of each of the sliders falls, in each of the different respective positions of the slider, whereby the slider is retained in any position in which it may be placed by the operator. The opposite prong of the slider carries a projection 13, which extends therefrom to engage any one of a plurality of contacts 14, which are mounted on a rider 15, which is reciprocated along a rotating shaft 16. This shaft is driven by a motor 17 through a suitable gear reduction drive 18. The motor 17 may be a synchronous motor of ordinary construction such as is commonly used in clocks. The shaft is provided with a double spiral groove, or double helix, which extends throughout that portion of the length thereof adjacent to the groups of slots 1 and sliders 3. The spiral groove extends about the shaft in both a right hand and a left hand direction, the right and left hand spirals being connected at the ends. In the rider 15 is mounted a pin 15' (shown in Figs. 3 and 4) having a portion which is suitably shaped to ride in the spiral groove and thereby, as the shaft rotates, to cause movement of the rider first to the right and then to the left, the pin 15' riding from the forward, or left handed, portion of the spiral into the reverse, or right handed portion of the spiral at the ends of the shaft.

The contacts 14 comprise two groups, A and P, the group A being for the A. M. period and cooperating with the A. M. group of sliders and the group P being for the P. M. period and cooperating with the P. M. group of sliders. The corresponding contacts of the two groups are connected together by conductors 19 carried upon the back of the rider. Each pair of corresponding contacts 14 is also connected to respective sliding contacts 20, 21, 22, 23, 24 and 25, which slide along corresponding bus bars 20', 21', 22', 23', 24' and 25'. These bus bars are arranged parallel to the shaft 16 and correspond to the different operations to be effected by the preselector. That is, the bus bar 20' corresponds to the off condition of the receiver and is connected through brush 20 with the extreme upper and lower contacts of the rider. Bus bars 21', 22', 23', 24' and 25' correspond respectively to the five stations WOR, WICC, WHN, WJZ and WEAJ to be selected at different times.

These bus bars 20' to 25' are shown considerably displaced from rider 15 for purposes of clearness but actually are mounted immediately adjacent thereto. This is apparent from Fig. 3 which is a back view of the rider and which shows the mounting of the contacts 20 to 25 which ride upon these bus bars.

These bus bars 20' to 25' are respectively connected through conductors 26 to the remote control system, later to be described, of the receiver. The common return conductor 27 of this remote control system is connected through member 40 of the preselector, switch 28, member 38, conductors 29, 29' and 32 and thence alternately through switches 30 and 31 to the conducting plates 9 and 10. That is, during the hours of the morning the conductor 27 is connected through the switch 28, conductors 29 and 29', plate 32, switch 31 and member 33, to the conductor 9, and during the hours of the afternoon it is connected

through the switch 28, conductors 29 and 29', plate 32, switch 30, and member 34, to the conductor 10.

The switches 30 and 31 are arranged at opposite ends of the shaft 16 and each of the switches comprises a pin mounted in the slidable conducting plate 32, these pins being positioned in the path of movement of the rider 15 so as to be engaged thereby to actuate the slider 32 either to the right or to the left dependent upon the direction of motion of the rider. When the slider 32 is actuated to the left to the position shown, the pin at the left end of the slider engages a conducting arm 33 which is conductively attached to the plate 9. This occurs when the rider 15 is at the extreme left end of the shaft, or at 12:00 o'clock midnight. When the rider 15 is at the opposite end of the shaft it engages the corresponding pin of the switch 30 carrying the slider 32 to the right and bringing the right end pin into engagement with a conducting arm 34 which is conductively connected to the plate 10. At the same time the switch 31 is, of course, opened, the pin of this switch being moved away from the arm 33.

The sliding bar 32 is retained in either of its two positions by means of two recesses 35 provided in the right end thereof and which cooperate with a spring pressed detent 36 which may be mounted in any suitable support (not shown).

Since the movement of the rider 15 along the shaft 16 is comparatively slow the contacts 14 thereof are in engagement with the sliders 5 during considerable periods and the time of engagement between any contact 14 and a respective slider may vary to some extent. In order that the desired tuning of the receiver may be effected at accurately preselected times as, for example, at the end of each fifteen minute interval the switch 28 is provided, this switch being arranged to close its contact at the end of each fifteen minute interval and for a time only sufficiently long to permit the desired tuning operation to be effected. These contacts are then again opened. This operation of the switch 28 is provided by means of two cams 37 and 37' shaped as indicated on the drawing. In the position shown the cams retain the contacts of switch 28 apart. If it be assumed that the shaft rotates in counterclockwise direction, however, the member 38, which carries one contact of the switch and which rides upon the cam 37, first falls off the shoulder 39 of the cam 37 and thus causes the two contacts of the switch 28 to engage. At a desired interval later, which may be about ten seconds, the member 40 which carries the opposite contact of the switch 28, falls off the corresponding shoulder 41 of the cam 37', thus causing the contacts of the switch 28 to separate. This operation occurs at the end of each fifteen minute interval, the contacts being retained open between operations.

Manual control for the switch 28 is also provided. This manual control comprises the handle 8 which extends through the face plate 1 of the device and which is provided on the rear of the face plate with a resilient member 42 having its opposite ends curved as indicated at 43 and 44. The end 44 cooperates with a shoulder 44' provided in the back of the face plate while the end 43 rides along the back 43' of the face plate. When handle 8 is pushed upward the curved end 44 rides up the shoulder 44' onto the back surface of the face plate 1 and retains the member in its upper position. When the member 8 is moved

downward the end 43 rides downward along the surface 43' of the face plate 1, tension of the member 42 retaining the member 8 in its lower position. The member 8 is also provided with an arm 45 which, when in its upper position, engages an arm 46 of the member 38 and raises it to an extent sufficient to prevent engagement of the contacts of the switch 28. In this way the program device is completely disabled and disconnected from the receiver.

The left end of the shaft 16 shown in the drawing is connected through a suitable clock gearing arrangement 47 to the hands of the clock 2, which is shown in Fig. 1. This clock may, of course, be positioned at any desired location but is conveniently located between the A. M. and P. M. groups of control members as indicated in Fig. 1.

The clock may be set by operation of knob 6 on the shaft 16 of the program device, the time intervals of the program device being thereby always in agreement with the indication of the clock. In order to permit rotation of shaft 16 by knob 6 without rotation of the motor 17, a suitable clutch, or friction drive connection, is provided between the motor and the shaft. As shown, the motor operates gears 80 and 81, the latter of which is frictionally engaged by member 82 which is rigidly attached to shaft 84 which, in turn, is geared to shaft 16. When the shaft is turned by knob 6, member 82 rotates with shaft 84, gears 81 and 80 and hence the motor remaining unaffected by the turning of the setting knob.

The face of the clock is provided with an aperture 48 in back of which rotates a disk 49. This disk rotates once in twenty-four hours. The half 50, of it, is colored white, and the other half 51 is colored black, so that either white or black appears through the aperture 48, this comprising an indication as to whether the upper or the lower group of sliders is effective at the particular time.

Fig. 3, as previously stated, illustrates a back view of the rider 15 and shows the contacts 20, 21, 22, 23, 24 and 25 thereon. It also shows additional members 52 between which the connections 19 of Fig. 1 are made, these connections comprising flexible conductors which may be positioned in the grooves 53 and 54 extending lengthwise of the back of the rider.

Before describing in further detail the operation of the program device illustrated in Fig. 2, I will refer to Fig. 5 which illustrates a remote control system with which it may be employed. In Fig. 5 I have indicated at 55 the tuning element of the radio receiver, which may be the ordinary tuning condenser, this tuning element being arranged to be driven by a motor 56 having field windings 57 and 58. On the shaft of the motor is indicated a commutator comprising two conducting segments 59 and 60, which are insulated from each other as indicated at 61. About this commutator are positioned contacts 20'', 21'', 22'', 23'', 24'' and 25'', which are connected to the corresponding bus bars 20' to 25'. The two segments 59 and 60 are connected respectively to one terminal of the motor field windings 58 and 57, the other terminals of which are connected through conductor 27 to one side of a source 72 of energy for operating motor 56. The opposite side of source 72 is connected to member 40 of switch 28 of the program device and thence through the program device to bus bars 20' to 25' dependent upon the operation

selected by the program device. Accordingly, it will be observed that whenever a connection is completed by the pretimer from member 40 through switch 28 to one of the bus bars 20' to 25' the motor is energized to operate the condenser 55 in a direction, dependent upon the field winding energized, to a position corresponding to the bus bars 20'—25' through which the circuit is completed. When such a position is reached, the insulating section 61 moves under the contact 20'' to 25'' through which the motor is energized and thus deenergizes the motor.

The bus bar 20' is connected to contact 20'', which is positioned on the commutator at a point which does not correspond to any station to be received. At this point the commutator is arranged by means of a projection 62 which engages one arm 63 of a switch 64 to open said switch. This switch is connected in series with the power supply circuit to the receiver, which is deenergized when this switch is opened. When a circuit is closed through the program device from member 40 to any of the bus bars 20' to 25' the commutator is operated to the corresponding position and upon its initial movement permits switch 64 to close and thus energize the receiver.

Shown at the left of the diagram are a number of keys which may be operated for touch, or push button, tuning purposes. Each of these keys when pressed inward operates a movable contact 71 thereof downward. This contact 71 of each key except the upper one operates between two outer contacts, the lower of which is connected to the corresponding brush 20'' to 25'' of the commutator, and the upper of which, except for the key marked "Off", which has no upper outer contact, is connected to the movable contact 71 of the next adjacent key. Thus, for example, if key WJZ be pressed, a circuit is complete from one side of the source 72 through the armature 71 of the WJZ key and its upper contact, armature 71 of WJZ at its lower contact, brush 24'', segment 60 of the commutator, field winding 57 of the motor to the opposite side of the source 72. The "Off" key connects the upper side of the source to the brush 20'' corresponding to the off position of the commutator.

It will thus be seen that any of the five stations indicated may be selected either by operation of the key corresponding thereto or by means of the pretimer, or program device.

If the operator desires that the programs to be received be selected automatically throughout the day in accordance with a desired schedule he sets up the desired schedule by properly positioning the different sliders 5 in the face plate 1. He then moves handle 8 to the lower position to connect the program device to the control system of the receiver. The program device then at the end of each fifteen minute interval completes a circuit by means of switch 28, which effects the program selection desired at that time.

For example, with the sliders in the position shown in the drawing at 6:15 A. M. the circuit is completed from member 40, through switch 28, member 38, conductors 29, 29' and 32, switch 31, conductor 33, plate 9, slider 5 for the 6:15 A. M. time interval, fourth contact from the top on group A of contacts on the rider, one of conductors 19 to contact 24 which engages bus bar 24'. This bus bar is connected to contact 24'' on the distributor through which the circuit extends through winding 57, conductor 27, and source 72, back to switch 28. The motor now operates

until insulating section 61 of the commutator falls under contact 24'' when it becomes de-energized.

The receiver is now tuned to WJZ. A short time later switch 28 opens. It closes again fifteen minutes later to complete the same circuit except that it includes the slider for the 6:30 A. M. interval, top contact of group A on the rider, bus 20' and contact 20'' on the distributor which as previously stated causes the receiver to be turned off.

This operation continues at the end of each fifteen minute interval until sometime after 11:45 A. M. when rider 15 engages the pin of switch 30 and carries it into engagement with arm 34 thereby opening switch 31. The operations then continue but the selections are as determined by the position of sliders of the P. M. group, the sliders of the A. M. group being inactive.

If at any time when a program is being received the operator desires to change the program he may do so by merely pressing any of the keys indicated in Fig. 5. If he desires to select a station for which no key is provided he may do so by operating the switch 73 either to the right or left, thereby energizing the corresponding field winding of the motor, which operates the condenser to scan the entire frequency band. When a station is received which the operator desires he merely releases the key 73 which returns under a spring bias (not shown) to the neutral position.

The manner in which the rider 15 is mounted to be driven by the double-grooved shaft 16 and the follower is indicated in Fig. 4, where the parts are shown displaced for clearness. This figure illustrates the double grooved shaft 16 and the follower member 75 which is of lentil shape and mounted upon the pin of 15' which was mentioned in connection with Fig. 1. This pin 15' merely projects through a corresponding opening in one portion 76 of the boxing, the opposite portion of which is indicated at 77, these two portions being adapted to be suitably attached directly by means of bolts through the openings 78. These boxings are positioned within the non-conducting member 79 which may be moulded in the shape indicated and which carries the contacts 14 of Fig. 1.

While I have described my invention by reference to a form of employing rigid bus bars 20' to 25' arranged to effect connection between conductors 26 and the different contacts 14 carried by the rider it will be understood that these rigid conductors may be dispensed with, the contacts 14 being connected directly through flexible leads to conductors 26. Such flexible leads, of course, would be of sufficient length to permit reciprocation of the rider.

While I have shown a particular embodiment of my invention, it will, of course, be understood that I do not wish to be limited thereto, since different modifications may be made both in the circuit arrangement, in the instrumentalities, and in the mechanical construction employed without departing from the spirit and scope of my invention as set forth in the appended claims, and I contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a program device, a plurality of control conductors, a shaft, a rider mounted thereon and axially reciprocated thereby, said rider carrying

a plurality of contacts, each contact being connected to a respective one of said control conductors, a plurality of contacts spaced along said shaft and positioned to engage different contacts carried by said rider in accordance with a predetermined schedule, thereby to select one and another of said conductors at different times, a switch, a circuit including said switch, one of said control conductors and one of said plurality of contacts dependent upon the instant position of the rider, means on said shaft to close said switch at regular intervals thereby to complete said circuit in accordance with the instant position of said rider and the instant position of the contact engaged thereby, and means to render said contacts active during movement of the rider in one direction and inactive during movement of the rider in the other direction.

2. The combination, in a program device, of a plurality of settable contact members arranged side by side in a row and movable transversely of said row to a plurality of positions, a plurality of bus bars extending longitudinally of said row and parallel thereto, a contact carrier having contacts respectively engaging said bus bars and contacts engagable with said settable contact members in the different respective positions of said members, means to reciprocate said contact carrier along said parallel row and bus bars to engage said settable contact members in sequence, and means to render said contact members active during movement of said contact carrier in one direction and inactive during movement of said contact carrier in the opposite direction.

3. The combination, in a program device of a plurality of rows of settable contact members, said settable contact members of each row being movable transversely of the respective row to different positions, a plurality of conductors extending along said rows, a contact carrier having contacts respectively engaging said conductors and contacts engagable with said settable contact members in the different respective positions of said members, means to reciprocate said carrier along said rows of contact members to engage said contact members in sequence, means carried on said carrier to connect any one of said conductors with a settable contact member in either of said rows, and means to complete a circuit through contact members in one of said rows during movement of said carrier in one direction and through contact members in the other row during movement of said carrier in the other direction.

4. The combination, in a program device, of a plurality of conductors arranged side by side, a plurality of groups of contacts positioned along said conductors but disengaged therefrom, a contact carrier, means to reciprocate said contact carrier along said conductors, said contact carrier having contacts engaging said conductors and a plurality of groups of other contacts, each group of said other contacts cooperating with a corresponding group of said first mentioned groups of contacts, each contact of said first mentioned groups being positioned to engage one of the contacts of the corresponding group of contacts carried by said carrier, dependent on the position of the respective contact of the first mentioned groups, means on the carrier to connect a contact of any of the first mentioned groups to any of said conductors, and means to render one of said first mentioned groups active and the other inactive during movement of the

carrier in one direction, and to render said one group inactive and the other active during movement of the carrier in the opposite direction.

5. In combination, a plurality of conductors arranged side by side, a pair of common conductors extending along said plurality of conductors, a contact carrier movable along said conductors and carrying contacts engaging respectively said plurality of conductors and a pair of groups of contacts, each of said first mentioned contacts being connected to one contact in each of said groups, a pair of additional groups of contacts corresponding respectively to said groups carried by said carrier, the contacts of each of said last groups being spaced along the path of travel of said contact carrier and positioned to be engaged by the contacts of the corresponding groups carried by said carrier, the contacts of each of said last groups being continuously connected to a corresponding one of said common conductors, whereby any of said plurality of conductors may be connected to one of said common conductors, and means to complete the circuit from one and the other of said common conductors alternately to any of said plurality of conductors.

6. The combination, in a program device, of a shaft, a contact carrier, means to reciprocate said carrier along said shaft, a plurality of groups of contact members the contacts of said groups being spaced along said shaft and positionable transversely of the movement of said carrier to engage different contacts carried by said carrier, each group being connected to a common conductor, a two position switch, and means operable in response to movement of said carrier to the limits of its motion to reciprocate said switch between its two positions, said switch in one position interrupting connections to one of said common conductors and establishing connection to the other, and in the other position establishing connection to said one common conductor and interrupting connection to said other.

7. The combination, in a program device, of a plurality of bus bars, one of said bus bars being common to the others, said one bus bar comprising a plate, a plurality of contact members spaced along said plate each corresponding to a predetermined time and shaped continuously to grip said plate and to be settable in a plurality of positions crosswise of said plate, a contact carrier having a group of contacts, cooperating with said contact members in said different respective positions crosswise of said plate, means to move said carrier longitudinally of said plate whereby said contacts engage first one and then another of said contact members in sequence, each of said contacts carried by said carrier being in continuous engagement with a corresponding one of said bus bars.

8. In combination, a shaft driven continuously at constant speed, a contact carrier mounted thereon, means to reciprocate said carrier along said shaft at a constant speed, said carrier having a plurality of contacts continuously engaging on the one side respective stationary bus bars, and on the other side successive contact members, said contact members being spaced along said shaft, and each contact member being movable transverse to the movement of the carrier to engage different contacts on the carrier in accordance with the position of the contact member, and means to render certain of said contacts carried by said carrier active and others inactive during movement of the carrier in one direction, and to render said certain contacts inactive and said

others active during movement of the carrier in the opposite direction.

9. In combination, a shaft driven continuously at constant speed, a contact carrier mounted thereon, means to reciprocate said carrier along said shaft at a constant speed, said carrier having a plurality of contacts continuously engaging on the one side respective stationary bus bars, and on the other side, successive contact members, said contact members being spaced along said shaft, and each contact member being movable transverse to the movement of the carrier to engage different contacts on the carrier in accordance with the position of the contact member, said reciprocating means comprising a helical groove about said shaft having forward and reverse portions and fixed drive means on said carrier riding successively in said portions of said groove.

10. The combination, in a program device, of a row of contact members, a shaft, a contact carrier, means to reciprocate said contact carrier along said shaft, said contact members being positionable longitudinally of said carrier to engage contacts positioned along said carrier and carried thereby, the different contact members of said row corresponding respectively to different time intervals, a constant speed motor, a reduction drive connection from said motor for said shaft, a clock face having cooperating hour and minute hands, a drive connection from said shaft for said hour and minute hands and means to rotate said shaft free of said motor to set said clock.

11. The combination, in a program device, of a shaft having right hand, and left hand, helical grooves therein, said grooves being joined at the ends of said shaft to form a continuous groove, means to rotate said shaft continuously in the same direction, a contact carrier having a rider engaging one of said grooves so as to be reciprocated along said shaft as said rider is propelled by first one of said grooves and then the other, said carrier being restrained between a plurality of bus bars on the one side and a row of contacts on the other, the contacts of said row being positionable in a plurality of positions, longitudinally of said carrier, each position corresponding to a respective bus bar, and contacts on said carrier, each of said contacts engaging a respective bus bar and being positioned to be engaged by the contacts of said row when in the respective position longitudinally of the carrier.

12. The combination, in a program device, of a shaft having right hand, and left hand, helical grooves therein, said grooves being joined at the ends of said shaft to form a continuous groove, means to rotate said shaft continuously in the same direction, a contact carrier having a rider engaging one of said grooves so as to be reciprocated along said shaft as said rider is propelled by first one of said grooves and then the other, said carrier being restrained between a plurality of bus bars on the one side and a conducting plate on the other, a plurality of contacts carried by said carrier each contact engaging a respective bus bar and projecting toward said plate in positions transverse to said plate corresponding to the respective bus bar, and contacts adjustable transversely of said plate and positioned between said plate and the contacts of said carrier, conductively to connect said plate with any one of said bus bars through a respective contact on said carrier dependent upon the position transversely of said plate to which said adjustable contact is adjusted.

13. The combination, in a program device of a shaft having right hand and left hand helical grooves therein, said grooves being joined at the ends of said shaft to form a continuous groove, means to rotate said shaft continuously in the same direction, a contact carrier having a rider engaging one of said grooves so as to be reciprocated along said shaft as said rider is propelled by first one of said grooves and then the other, said carrier being restrained between a plurality of bus bars on the one side and a conducting plate on the other, a plurality of contacts carried by said carrier each contact engaging a respective bus bar and projecting toward said plate in positions transverse to said plate corresponding to the respective bus bar, and contacts adjustable transversely of said plate and positioned between said plate and the contacts of said carrier conductively to connect said plate with any one of said bus bars through a respective contact on said carrier dependent upon the position transversely of said plate to which said adjustable contact is adjusted, a panel parallel with said shaft having parallel slots therein spaced at regular intervals along said shaft and extending at right angles to the shaft and adjustment members positioned in said slots, each of said members carrying a respective one of said adjustable contacts.

14. The combination, in a program device, of a shaft having right hand, and left hand, helical grooves therein, said grooves being joined at the ends of said shaft to form a continuous groove, means to rotate said shaft continuously in the same direction, a contact carrier having a rider engaging one of said grooves so as to be reciprocated along said shaft as said rider is propelled by first one of said grooves and then the other, said carrier being restrained between a plurality of bus bars on the one side and a pair of conducting plates on the other, each of said plates having positioned thereon, and spaced at regular intervals along said shaft, conducting members arranged for adjustment transversely of the plate, contacts on said carrier, each contact engaging a respective bus bar and arranged for engagement with said conducting members when positioned to correspond to the respective bus bar, thereby to make connection between said plate and one of said bus bars dependent upon the position of said adjustable member, and means to connect said bus bars in circuit with one of said plates when said carrier moves in one direction and in circuit with the other plate when said carrier moves in the other.

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