

Nov. 19, 1935.

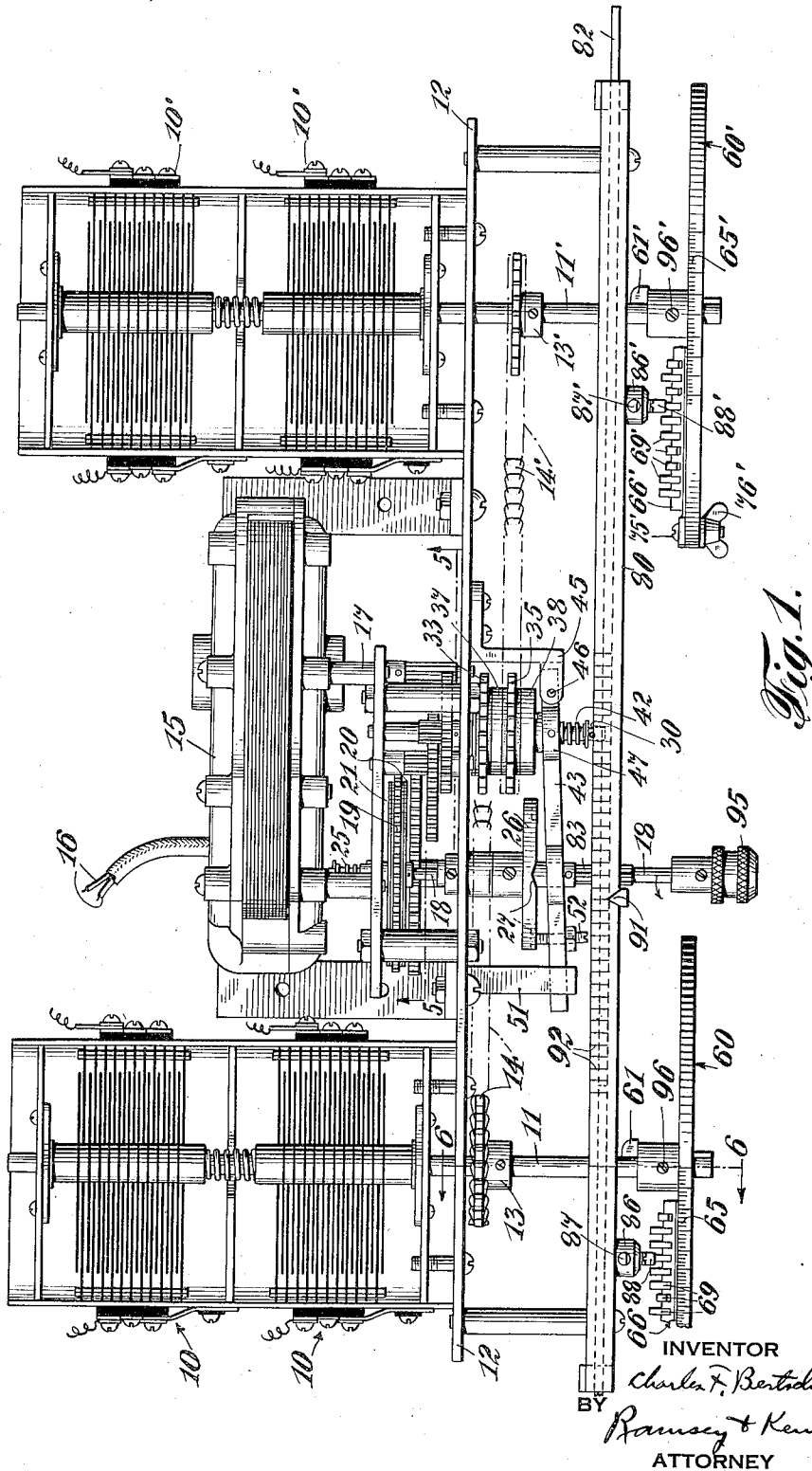
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2,021,476

RADIO TUNING MECHANISM

Filed Nov. 23, 1931

5 Sheets-Sheet 1



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5 Sheets-Sheet 2

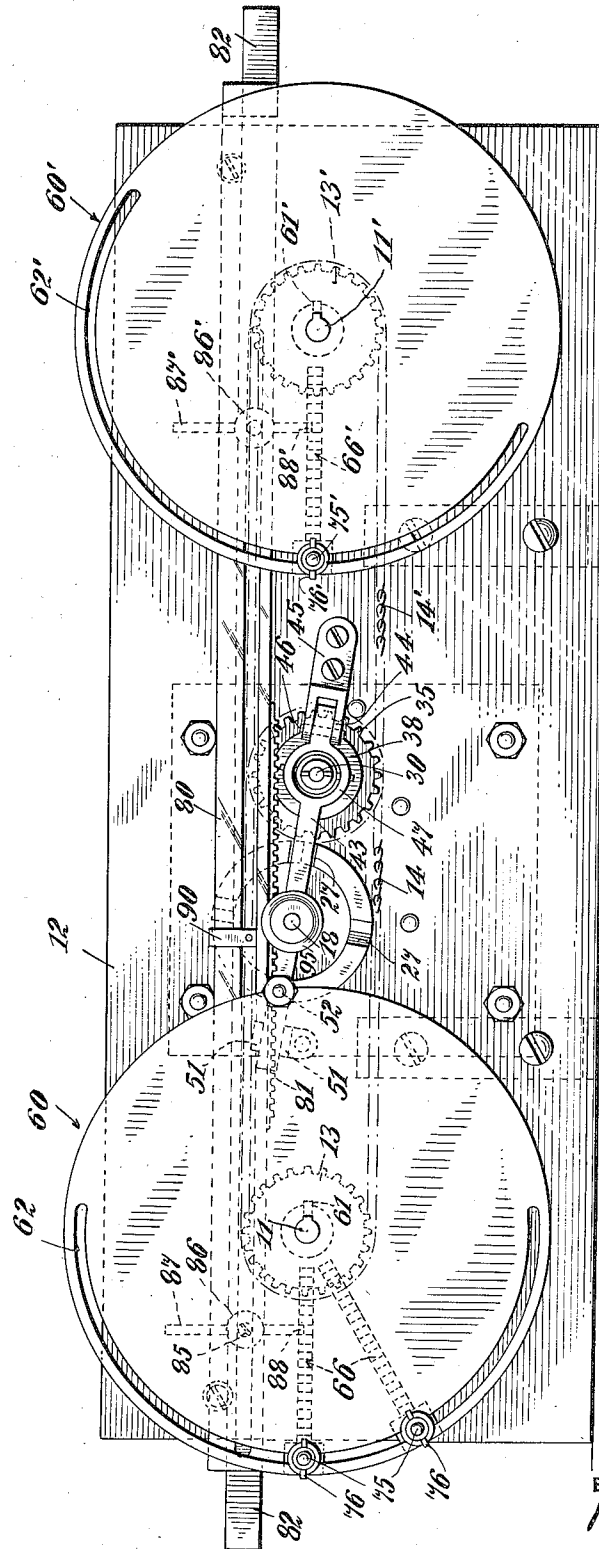


Fig. 2.

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5 Sheets-Sheet 3

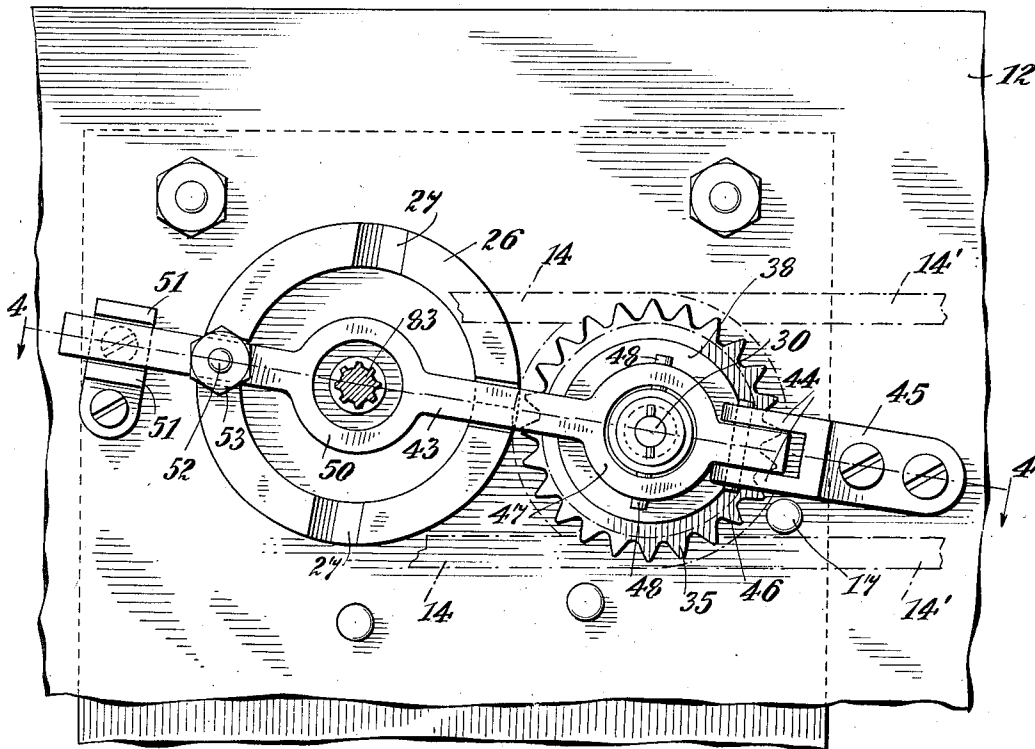


Fig. 3.

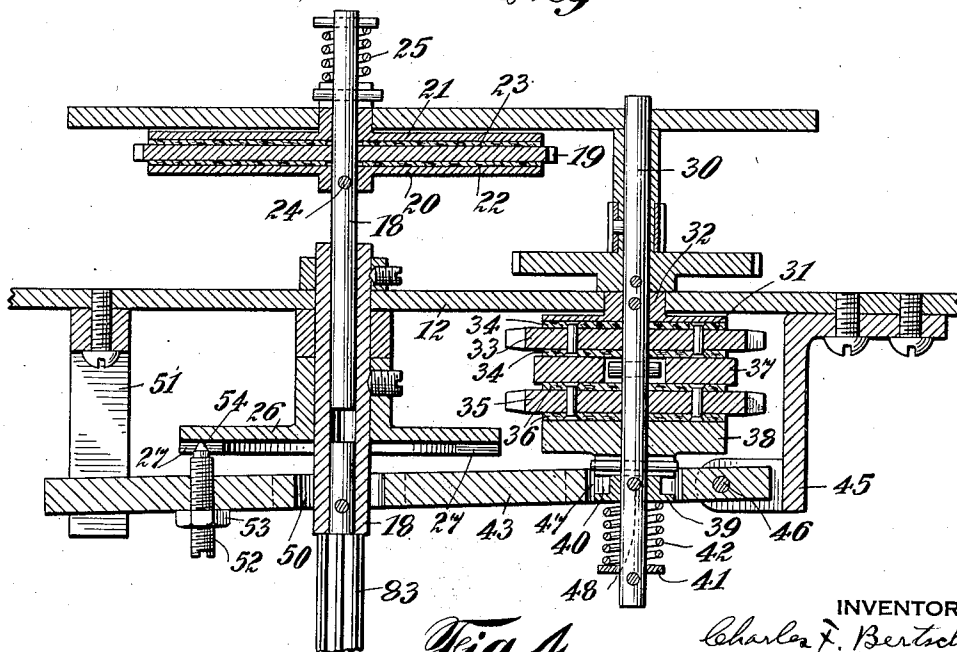


Fig. 4.

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5 Sheets-Sheet 4

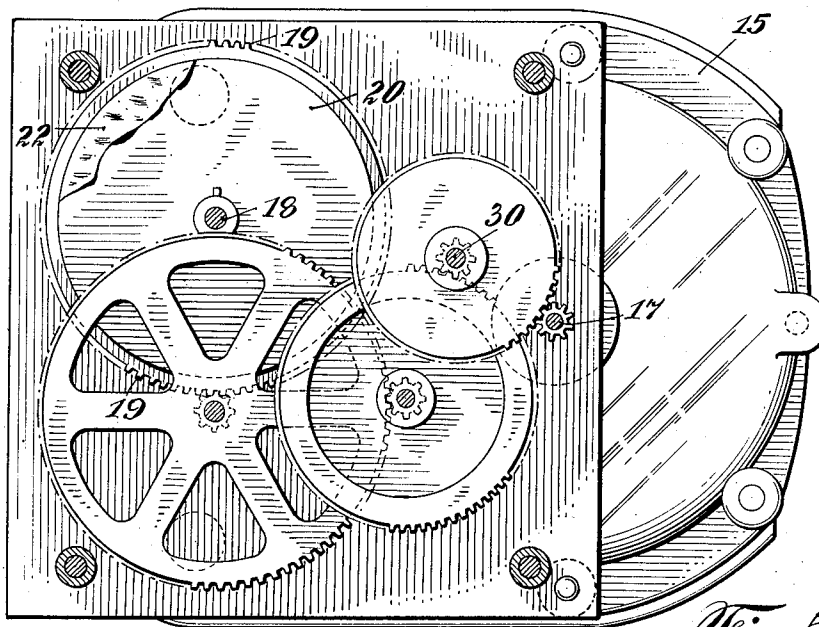


Fig. 5.

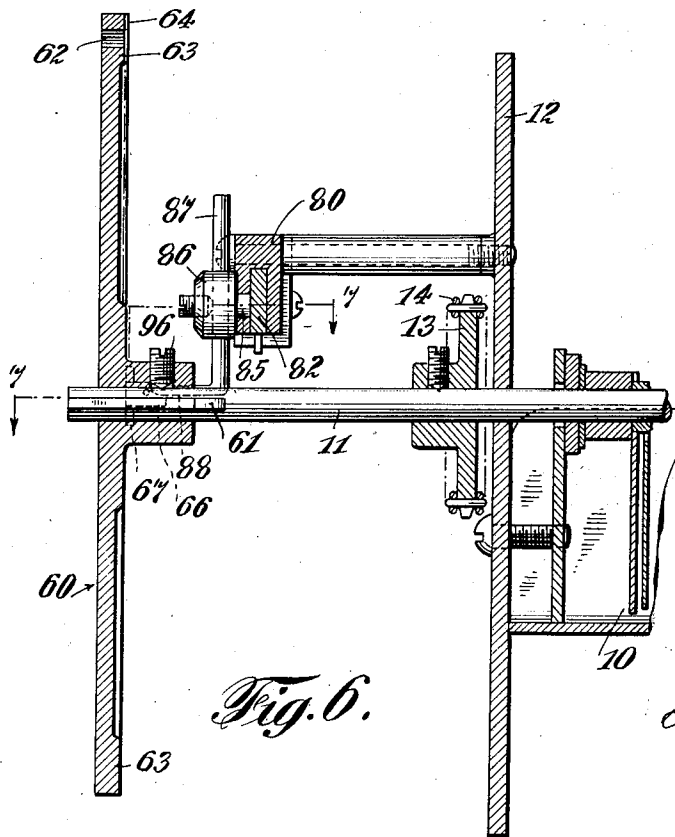


Fig. 6.

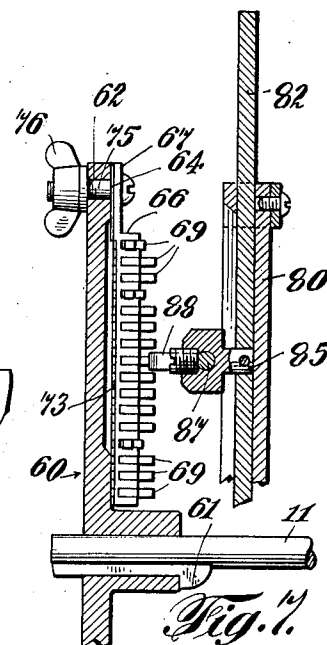


Fig. 7.

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5 Sheets-Sheet 5

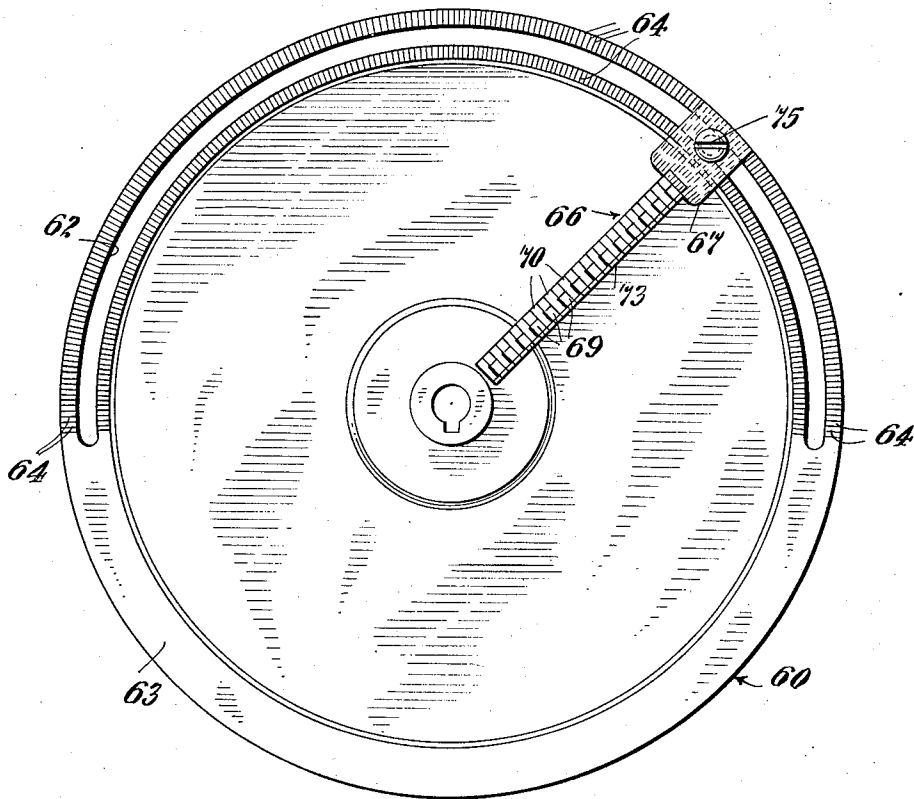


Fig. 8.

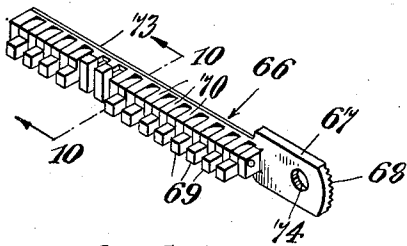


Fig. 9.

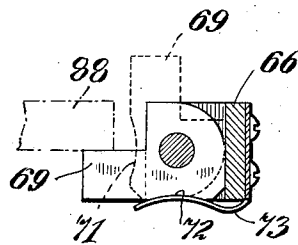


Fig. 10.

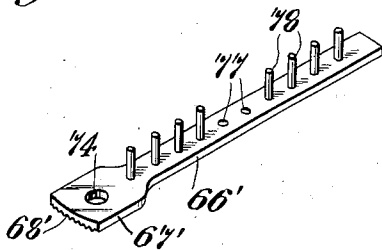


Fig. 11.

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2,021,476

RADIO TUNING MECHANISM

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Application November 23, 1931, Serial No. 576,641

9 Claims. (Cl. 250—20)

This invention relates to tuning mechanism for radio receiving sets and like apparatus and more particularly to automatic tuning mechanism for such purposes.

An object of the present invention is to provide means for automatically tuning a radio receiving set to cause the same to receive predetermined programs at predetermined times.

Another object of the invention is to provide mechanism for actuating tuning mechanism at intervals over a desired period of time.

Another object of the invention is to provide means for automatically tuning a multiplicity of radio receiving sets for receiving radiant impulses of different frequencies.

According to the present invention, programs may be determined in advance and by simple mechanism the radio receiving apparatus may be actuated to receive such programs according to the predetermined schedule. In order that these purposes may be accomplished the actual tuning mechanism of the radio receiving set is arranged to be mechanically operated through the agency of power-driven apparatus, preferably operated by an electric motor. In order that the tuning mechanism be actuated at the desired intervals, use is made of a mechanical clutch for engaging the source of power with the driving mechanism of a tuning apparatus at predetermined intervals. This mechanical clutch may be operated by the same motor that furnishes power for the tuning mechanism. In conjunction with the foregoing equipment, use is made of selective equipment for determining the position of the tuning mechanism at each actuation thereof. In the simplest form of selective equipment use is made of a disc mounted on the drive shaft for the tuning apparatus, such disc having a plurality of protruding members which are positioned to lie in the path of a stop member, which stop member in turn is moved to engage various of the protruding members at various times.

More specifically the arrangement in the preferred form consists of a power supply in the nature of an electric motor, which power supply is intermittently engageable with actuating mechanism for the radio tuning apparatus through the agency of a clutch engaging the same motor or source of power. Reduction gears are utilized to cause the clutch to be moved into engaging position at stated intervals, and the same source of power also moves the selective stop to cause it to lie in the path of the rotating disc fixed to the tuning mechanism shaft so that selective protruding members will be engaged by

the stop at various times. In conjunction with the radio receiving apparatus, the present invention also may be used to simultaneously tune in other receiving apparatus, such as a set for receiving waves utilized for television, etc.

Other objects, features and advantages of the present invention will be readily understood by reference to the following detail description read in conjunction with the accompanying drawings, wherein:

Figure 1 is a plan view of the mechanism for automatically tuning a radio receiving set to receive a predetermined schedule of programs, such receiving set having associated therewith a second receiving set for receiving radiant impulses of a different character.

Figure 2 is a front elevation of a part of the mechanism for carrying out the purposes set forth hereinbefore.

Figure 3 is an enlarged front elevation of the clutch mechanism employed in the invention.

Figure 4 is a section taken substantially on the lines 4—4 of Figure 3.

Figure 5 is a section taken substantially on the lines 5—5 of Figure 1, showing the arrangement of gears connecting the electric motor with the clutch actuating mechanism.

Figure 6 is a section taken substantially on the lines 6—6 of Figure 1.

Figure 7 is a section taken substantially on the lines 7—7 of Figure 6.

Figure 8 is an enlarged elevation of the disc utilized in selecting the programs to be received.

Figure 9 is a perspective form of an arrangement of protruding members to be secured to the disc shown in Figure 8 for aiding in the selection of programs.

Figure 10 is a section taken substantially on the lines 10—10 of Figure 9, showing the arrangement for holding the protruding members in desired position, and

Figure 11 shows a modified form of support for protruding members.

Referring now to the drawings, 10 indicates a pair of tuning condensers utilized in conjunction with other parts for tuning a radio receiving set to receive desired radiant impulses. As shown in the drawings, these condensers 10 are mounted on a common shaft 11, so that rotation of shaft 11 causes simultaneous rotation of the rotors of the two condensers. It is to be understood, however, that the condensers must not necessarily be mounted on a common shaft but can be mounted on a plurality of shafts which can be interconnected so that rotation of one

of the shafts will cause relation of all of them. Since this practice is conventional in radio receiving sets, it is deemed not necessary to illustrate the same in detail. Secured to the shaft 11 in front of a main supporting plate 12 is a sprocket wheel 13 engaged by a chain 14, which chain is connected intermittently in a manner to be described hereinafter to cause rotation of the shaft and consequent tuning of the receiving set.

Secured to the plate 12 in a desired manner is an electrical motor 15 supplied with energy through leads 16 from any convenient source. This motor 15 may be any type of electrical motor, but it has been found in practice that beneficial results can be obtained when the motor is a synchronous motor. The shaft 17 of motor 15 is connected through a train of gears to a clutch actuating shaft 18, the train being of such ratio that the shaft 18 makes a complete turn once every hour. The various gears in this train are of the usual reduction type, with the exception of the last gear 19 which is so arranged as to permit rotation of shaft 18 independently of the rotation of the gear train. For this purpose, gear 19 is not keyed to shaft 18 but is free for rotation thereon. The gear 19, however, is positioned between two plates 20 and 21 which are provided with faces 22 and 23 respectively of cork or other suitable material which will ordinarily grip the gear 19 with sufficient force to cause simultaneous rotation of the gear and the plates 20 and 21. The hub of plate 20, as shown in Figure 4, is keyed to shaft 18 by means of a pin 24, while a spring 25 serves to force the plate 21 against the opposite side of the gear 19. With this pressure applied by the spring, rotation of gear 19 by means of the train of reduction gears will be communicated to the shaft 18, but at the same time this shaft 18 may be rotated independently of gear 19 since the faces 22 and 23 will permit some slipping between their surfaces and the faces of the gear.

Secured to shaft 18 on the opposite side of plate 12 from the gear 19 is a clutch actuating disc 26, in the face of which are cut (in the present instance) four slots 27. Since the shaft 18, as before stated, makes approximately one revolution per hour, and since these slots 27 are spaced equidistantly around the disc 26, it will be apparent that the slots are spaced apart approximately 15 minutes in the rotation of the shaft and disc.

In the event it is desired to receive radiant impulses for television or other purposes, simultaneously with the broadcast program selected by condensers 10, another receiving set with which the condensers 10' are associated may be employed. These condensers are mounted in the fashion similar to condensers 10 on a common shaft 11', which also has a sprocket wheel 13' secured thereto, over which passes a chain 14'.

In order that the tuning condensers of either or both receiving sets may be actuated to receive desired programs at predetermined times, use is made of a clutch arrangement for communicating power through either one or both of the chains 14 and 14' to the respective shafts 11 and 11'. This clutch mechanism is shown in detail in Figure 4, wherein a shaft 30 is illustrated, such shaft being one of those contained in the train of reduction gears and being extended a distance beyond the face of plate 12. While the motor 15 is energized, this shaft 30 is being constantly rotated. Secured to shaft 30 is a disc 31 having a hub 32 fitting in an opening cut in plate 12 and serving as a bearing for the shaft relative to this plate. A sprocket wheel 33 having faces 34 of cork or other

suitable frictional substance is loosely mounted on this shaft 30. A second sprocket wheel 35 is also loosely mounted on shaft 30, such wheel being provided with faces 36 of cork or other suitable frictional material. Located between the wheels 33 and 35 is a washer-like member 37 secured to the shaft 30 for sliding engagement therealong. Adjacent the outside face of wheel 35 is a disc 38 which is also keyed to shaft 30 for sliding movement therealong. Adjacent the disc 38 is a pulley 39 having a groove 40 cut in the peripheral surface thereof. The pulley 39 is likewise keyed to shaft 30 for sliding movement therealong. Near the end of shaft 30 is a small washer 41, and a spring 42 is positioned between washer 41 and pulley 39 to ordinarily force this pulley 39 against the washer 38 and thereby compress the various cork faces against their contacting surfaces of other elements.

To control the pressure applied to the pulley 39 by the spring 42, use is made of a clutch bar 43, one end of which is pivotally mounted between the forks 44 of a Z bar 45, one end of which is rigidly secured to plate 12. A pin 46 is utilized for this pivotal mounting. The clutch bar 43 has an annular enlargement 47 fitting over the exterior of pulley 39 and pins 48 spaced diametrically opposite from each other extend through the enlargement 47 into the channel 40 of the pulley 39. The clutch bar 43 is provided with a second enlargement 50, through which shaft 18 passes. The end of bar 43 is positioned between two guide members 51 which serve merely to hold the bar in proper alignment with its pivotal mounting. Extending through bar 43 is a screw threaded plunger 52 locked in position by means of a nut 53. One end of the plunger 52 is pointed, as indicated at 54, and this end pressed against the outside surface of the disc 26 in such fashion that it will drop into the slots 27 in this disc as the disc is rotated.

For selecting the various programs, use is made of a large disc 60 removably keyed to shaft 11. A stop 61 is provided on this shaft to aid in determining the position of the disc thereon. The disc itself is shown in detail in Figure 8, in which figure the arrangement is shown as having a slot 62 cut partially around the same near the outer edge thereof. The outer portion of the disc is provided with a raised shoulder 63, in which are cut a number of radial grooves 64. The periphery of the disc is marked off with a scale 65, as shown in Figure 1.

A number of stop bars 66 are adapted to be secured to the disc in various positions. As shown in Figure 9, the preferred form of stop bar is in the nature of a long flat member having a head 67, the under side of which is provided with teeth 68 of such shape as to fit into the radial grooves 64. Mounted along the surface of the bars 66 are a number of adjustable stops 69 mounted between spacers 70. These stops 69 are rotatable through an angle of approximately 90 degrees and have a pair of depressions 71 and 72 at right angles to each other. A curved spring bar 73 is fastened to the under side of the bar 66 and extends around into position to bear in either of the depressions 71 or 72. The head 67 of the bar is provided with an opening 74 through which a bolt 75 (Figure 7) passes, such bolt being adapted to pass through the slot 62, with the aid of a wing nut 76 locking the respective bars rigidly in place on the disc. An alternative form of stop bar and stops is shown in Figure 11, in which the bar 66' is pro-

vided with a number of spaced openings 77 along its length, into which removable pins 78 may be inserted. The head 67' is provided with an opening 74' for the reception of a bolt and wing nut in the same manner as that employed in the bar 66.

Mounted in front of plate 12 is a substantially hollow rack guide 80, the under side of which is open an amount sufficient to permit the extension therethrough of the teeth 81 of rack 82. These teeth 81 are in engagement with teeth 83 on shaft 18. A part of the front of the rack guide 80 is open to permit the extension therethrough of a pin 85 on which is mounted a boss 86. Extending through the boss is a pin 87 having a right angular extension 88, which extension is movable into the path of the stops carried by the disc 60. Extending upwardly also from the rack and through the front opening thereof is a bar 90 which has a pointer 91 extending over the top of the rack guide 80 in position to cooperate with scale markings 92 on the top of the rack guide. A knob 95 is positioned on the end of shaft 18 for permitting manual rotation of this shaft.

A similar disc 60' is mounted in the same fashion on the shaft 11' and corresponding parts are provided for this arrangement, these parts being given the same reference characters as those associated with shaft 11, with the addition of a prime after each reference.

The operation and use of the arrangement is substantially as follows: Before the system is put into actual operation the programs to be selected over a desired period are chosen. Having in mind the number of stations in the schedule, a bar 66 is positioned on the disc 60 at such location as to correspond to the position of the condensers for that station. The scale markings 65 on the periphery of the disc aid in determining the proper location of each bar 66. Since the bars 66 extend along radial lines from the center of the disc outwardly, it will be readily apparent that each bar can serve for an individual station. With the desired number of bars in position, the arrangement provides a number of movable stops which are in concentric circular arrangement with respect to the axis of the disc. These stops are so positioned that in conjunction with the other mechanism of the device they are located approximately 15 minutes apart over the period in which the device is to be used. Accordingly, certain of the stops in each bar are moved into outermost position according to the time at which it is desired to receive programs broadcast by the transmitting station for which the stop bars are set. For example, the innermost stop in one bar may be moved into operative position, the next outward stop of another bar moved into operative position, and so on around until the complete program is arranged. If it is desired to receive from one transmitting station for a longer period than 15 minutes, then consecutive stops are moved outwardly along that station stop bar. With the disc arranged according to schedule, it is adjusted on the shaft 11 being locked thereon by means of a set screw 96 or in any other suitable manner. The rack 82 is then moved to the right as far as the same can go, so that it is in position at the beginning of its path of travel, the direction of rotation of shaft 18 in the present instance being counter-clockwise. When the rack has been moved to this position the stop 88 lies in the path of the inner most stops on the bar 66 so that

when the disc 60 is rotated this stop will be contacted by the innermost stop which is in operative position. The system is so constructed that in this arrangement the pointed end 54 of the pin 52 rests in one of the grooves 27 of disc 26.

The system is now in condition to start automatic operation. The motor 15 is energized, starting the train gears to rotating and, since pin 54 is seated in a groove 27, the clutch mechanism controlling the actuation of the tuning mechanism is closed to cause operation thereof. As soon as shaft 30 starts rotating, the sprocket 33 will begin to rotate, due to the closing of the clutch arrangement. Rotation of sprocket 33 causes movement of chain 14, which movement is imparted to the sprocket 13, thereby rotating shaft 11. This rotation continues until the selected innermost stop on one of the bars 66 comes into contact with the horizontally moving stop 88. When such contact is made, the shaft 11 can no longer rotate but the pin 52 is still seated in the groove 27, so that normally the sprocket 33 would continue to rotate. However, the provision of cork faces, or similar faces, on the sprocket 33 permits slipping between the shaft 30 and this sprocket, so that the sprocket may remain stationary relative to the shaft.

Continued movement of the gear train causes rotation of shaft 18 with consequent rotation of disc 26. As this disc rides slowly onward, the end 54 of pin 52 rides out of the groove 27 in which it was seated and now presses against the raised shoulder on this disc. As soon as the pin rides on this raised shoulder the clutch bar 43 is moved outwardly an amount sufficient to remove the pressure from the clutch parts, so that no rotation could be imparted to the sprocket 33.

The pin rides on the shoulder of the disc for approximately 15 minutes, at which time the end of the pin drops into the next groove 27, permitting the clutch bar 43 to move inwardly, thereby applying compression upon the clutch parts. As soon as this takes place rotation is again imparted to the sprocket wheel 33, which rotation is transmitted to shaft 11 through the chain 14. The shaft 11 then rotates until the next outward movable stop on one of the bars 66 contacts with the horizontally movable stop 88, at which point rotation of shaft 11 ceases due to slipping in the clutch. This stop 88 of course has been moved into the lines of the next concentric circle of stops, due to movement of rack 82 by engagement of the teeth 83 with teeth 81.

Similar operation of the mechanism continues throughout the period for which programs have been selected.

If it is desirable, the second receiving set may be operated simultaneously with the first, since corresponding parts are furnished therewith and since a sprocket wheel 35 is provided for rotation of shaft 11'. Programs may be selected for this second set as well as for the first, and if the second set is utilized for receiving a television program along with the other program, these programs may be synchronized and simultaneously received.

The provision of the double sprocket wheels shown in the clutch permits continued rotation of one sprocket wheel after the other has stopped, so that if rotation of one shaft 11 or 11' is halted before the other, the other may still be moved to proper position.

A feature of the present invention is its flexibility, since it may be adapted to meet various conditions. For example, if it is desired to start

the set in the middle or at any point in the period for which selections have been made, the mechanism may be so adjusted. Due to the slipping between the gear 19 and shaft 18, in the manner described in detail hereinbefore, it is possible to rotate this shaft 18 manually by merely turning the knob 95. By so turning this knob the rack 82 may be moved into the path of a stop positioned in any of the concentric circles corresponding to the particular time over the period selected. The desired position may be located by use of the pointer 91 which, in cooperation with the scale 92, indicates the position of the rack and the stop 83 at all times.

Since the signals from all broadcast stations are not received at a given point with quick intensity, it may be necessary to arrange the system to compensate for any inequalities in volume between various stations, so that during a given period in which a number of stations are being received consecutively, it will not be necessary to manually control the volume of any station. To accomplish this it is merely necessary when setting the bars for a series of programs to shift the bar 66 representing a station of great amplitude a slight bit from the correct position for the wave length of that station, so that the waves received are not received at their peak of amplitude. This is known commonly in the art as slightly de-tuning. By so shifting the proper bar 66 when setting up the programs, the signals from all the stations may be made of approximate equal amplitude.

It will be understood from the foregoing that while the invention is shown as applied to a system including the tuning mechanisms for two independent receivers of radiant impulses that the invention can be employed with a single receiver or with more than two receivers. Furthermore, it will be evident that various changes can be made in the parts of the invention without departing from the spirit thereof and in view of this, it is to be understood that the invention is not to be limited to the illustrated embodiment but is to be limited only by the scope of the following claims.

I claim:

1. In a device of the class described, the combination of a radio receiving set having tuning mechanism to select waves to be received, a source of continuous motive power driving a timing device, a selector disc associated with said tuning mechanism, means controlled by said timing device for intermittently connecting said source of power to said disc to rotate said disc, a selector stop carried by said disc, and a movable stop driven by said source of power, said movable stop cooperating with said selector stop to selectively control said tuning mechanism when the selector stop engages the movable stop during rotation of said disc.

2. In a device of the class described, the combination of tuning mechanism to select radio waves of a predetermined wave length for reception, a source of continuous motive power driving a timing device, a rotatable disc connected to said tuning mechanism, selector stops radially mounted on said disc, a stop member movable in the path of the selector stops on said disc, said stop member being moved at a predetermined rate by said source of power, and means for intermittently transmitting power from said source to said disc for predetermined intervals to cause rotation of the disc until a selector means thereon engages said movable stop member, said means

for transmitting power being rendered inoperative to transmit power to the disc during an interval of transmission after the movable stop member has engaged a selector stop.

3. In a device of the class described, radio tuning means to select radio waves of predetermined length for reception, a source of constant motive power driving a timing device, means for operatively connecting said source of power with said tuning means at predetermined intervals to operate the tuning means and for disengaging the source of power from the tuning means at the ends of the intervals, stop means associated with said tuning means and movable therewith in circular paths, and a movable stop member driven in a linear path by said source of power, said stop members cooperating to control positioning of the tuning means during the interval of connection of the source of power to the tuning means.

4. In a device of the class described, tuning mechanism to tune in predetermined radio waves for reception, power means, a clutch mechanism operatively connecting said power means with said tuning means, timing devices driven by said power means for rendering said clutch mechanism effective at predetermined intervals, a time stop moved by said timing devices, and station selecting means comprising stops moved through the operation of said clutch mechanism for stopping the movement of said tuning mechanism when a predetermined position thereof has been reached at a given time interval whereby a predetermined radio program is automatically selected.

5. A device of the class described comprising tuning mechanism to select predetermined radio waves for reception, a source of constant motive power driving a timing device, a movable stop member, driving means between said stop member and said source of power for moving said stop member at a predetermined timed rate, a wave length selector operatively connected with said tuning mechanism and having parts engageable with said moving stop member, and means for intermittently transmitting power from said source of power to said wave length selector to drive the wave length selector at predetermined intervals of predetermined length, said power transmitting means being rendered inoperative to transmit power after said moving stop member engages a cooperating member on said wave length selector.

6. The combination with the tuning mechanisms of a plurality of receivers of radiant impulses, of a single source of continuous motive power, multiple clutch-controlled means for transmitting power from said source to said tuning mechanisms, a timing device driven by said source of continuous motive power, means associated with said timing device for intermittently actuating said multiple clutches to cause transmission of power to said tuning mechanisms to operate the same, and means for rendering any clutch inoperative to transmit power without preventing transmission of power by another clutch.

7. The combination with the tuning mechanism of a receiver of radiant impulses, of a source of continuous motive power, clutch-controlled means for transmitting power from said source to said tuning mechanism, a timing device driven by said source, and means associated with said timing device for intermittently actuating said clutch to cause transmission of power to said tuning mechanism to operate the same,

means for controlling the operation of said tuning mechanism to tune the same in accordance with a predetermined schedule, and means for interrupting the transfer of power from said clutch at any time during the fixed periods of energization thereof.

8. The combination with the tuning mechanism of a receiver of radiant impulses, of a driven shaft for said tuning mechanism, a plate carried by said shaft, a plurality of stops extending from one face of said plate and spaced concentrically from said shaft, a stop member movable into the path of consecutive concentric stops, and means for supplying energy to rotate intermittently said shaft and to move continuously said stop member.

9. In a device of the class described, a plurality of independent receiving devices for radio waves, said devices comprising tuning mechanisms, a timing device, clutch mechanism operatively connecting said timing device and said tuning mechanisms, independent selector mechanisms for each of said tuning devices, whereby each receiving device may be independently tuned from said timing mechanism at predetermined intervals, and means for rendering said clutch mechanism inoperative to transfer power to a tuning mechanism after said tuning mechanism is properly tuned without affecting transfer of power to another tuning mechanism.

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