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SELECTOR MECHANISM FOR AUTOMATIC TUNING

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Fig.1.

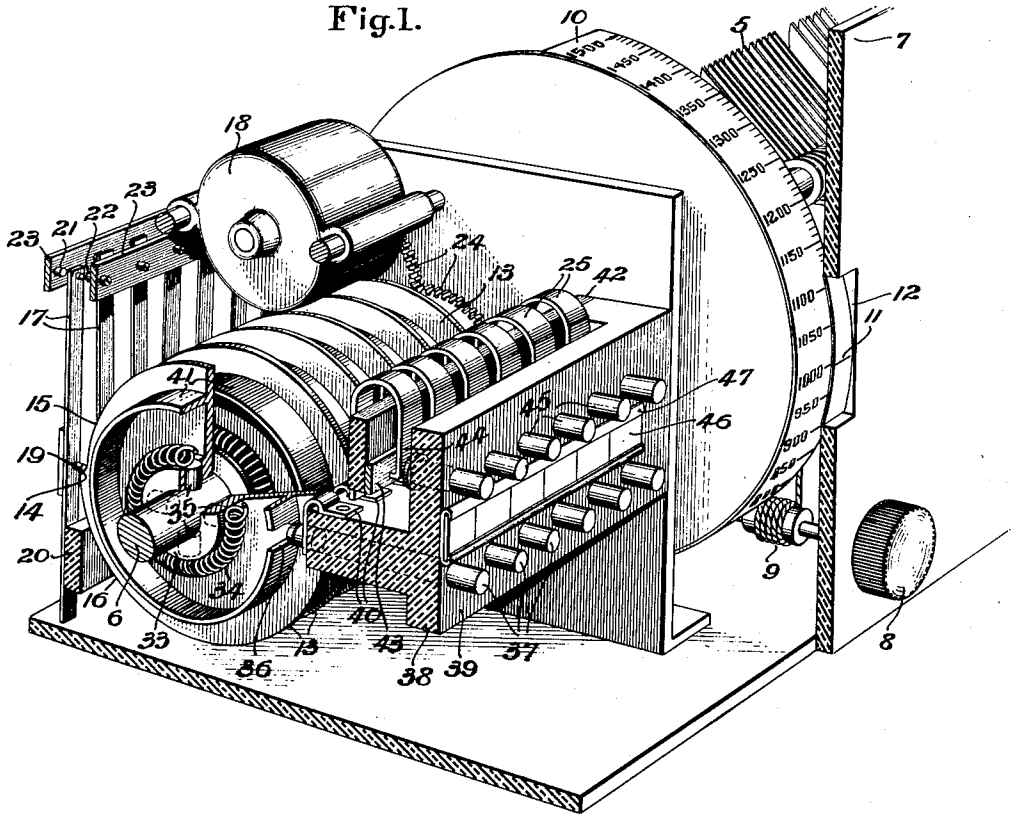
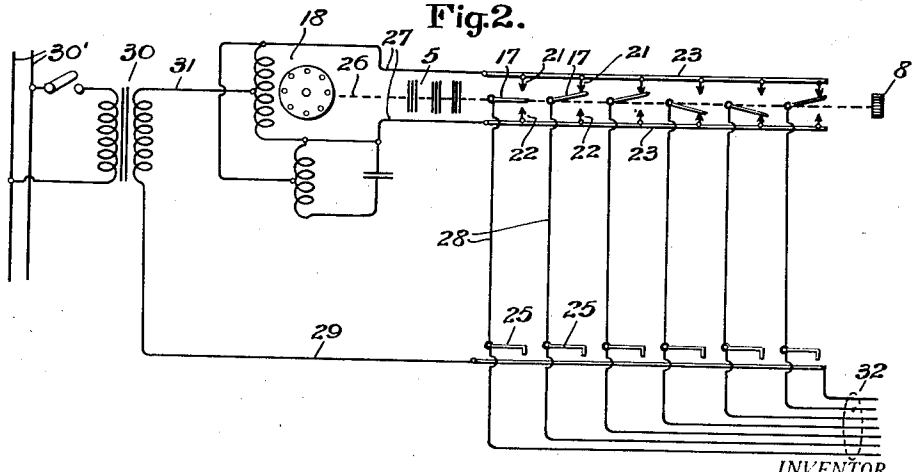


Fig.2.



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SELECTOR MECHANISM FOR AUTOMATIC TUNING

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3 Claims. (Cl. 172—239)

The present invention relates to electrical control means for selectively moving an apparatus control element to pre-determined positions of adjustment. More particularly it relates to automatic tuning means for radio receiving apparatus and the like, arranged to move the tuning control element or elements automatically to any one of a plurality of pre-selected positions of adjustment, whereby any one of a plurality of pre-selected stations may be tuned in.

In a control system of the general character above referred to, there may be associated with the element to be controlled, such as a tuning control shaft for example, a plurality of movable operating elements adapted to be adjusted with respect to a fixed controlling switch means, to provide for stopping the movement of the control element at pre-determined positions of adjustment.

In apparatus of the character of a radio receiver, as is well known, there are a number of positions of adjustment of the tuning control means which are more frequently used, such positions of adjustment being those corresponding to certain desired signals or stations which are transmitting the best programs for reception at the location of the apparatus, without appreciable interference. To obviate the necessity for manual adjustment of the tuning control means for the selection of any one of a plurality of such stations or signals, it is desirable that the control means of the receiving apparatus be adjustable automatically to the pre-selected positions of adjustment corresponding to such desired stations or signals.

In one form of such apparatus with which I am familiar, the desired positions of adjustment of the control means of the apparatus are obtained by manual adjustment, followed by an adjustment of automatic means arranged to stop the movement of the tuning control device at each of said positions.

The adjustable operating elements may take the form of cam members adjustably mounted upon a continuation of the tuning control shaft. Each cam member is provided with a cam surface adapted to contact with and to move a motor reversing switch or contactor into a neutral or open position, thereby to stop the driving motor for the tuning control shaft. By adjusting each cam member on the shaft to a predetermined angular position with respect to the tuning control means, the cam surface may be made to open the reversing switch with which it cooperates, at a predetermined and desired position of adjustment of such shaft and of the tuning control means connected therewith.

It is further desirable that the members or cams be readily adjustable at any time for changing any or all of the operating points, and while the apparatus is in operation, at a convenient point such as the front of the panel which is usually provided in connection with the apparatus.

Accordingly, it is an object of the present invention to provide automatic tuning or operating means for radio receiving apparatus and the like, which is adapted readily to be adjusted at any time while the apparatus is in operation, and without the use of tools, to provide a change in any one or all of a plurality of adjustable tuning points, and which is adapted to be adjusted from the front of a panel of the apparatus.

It is a further object of the invention to provide automatic tuning or operating means of the above character which is simple and easy to manufacture and which includes control elements adapted to be combined into a compact and symmetrical control arrangement for the panel of radio receiving and like apparatus.

The invention will better be understood from the following description when taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

In the drawing Fig. 1 is a view, in perspective and partly in section, of automatic tuning means embodying the invention as applied to radio receiving apparatus, and

Fig. 2 is a wiring diagram of a control circuit for the apparatus shown in Fig. 1.

Referring now to Fig. 1, tuning control means or a variable gang condenser for radio receiving apparatus is shown at 5 and is provided with a tuning control shaft 6 which is mounted adjacent to the panel 7 of the apparatus and is operated by a manual tuning control knob 8 located on the front of the panel and connected with the tuning control shaft 6 through a suitable cord drive indicated at 9. In the present example the tuning control shaft and control means 5 are provided with a suitable indicating drum 10 which operates in connection with an indicator 11 provided in a window 12, of translucent material, located in the panel front.

The above described manual tuning control system may be taken as representing any similar system for apparatus of that character having a movable control element or shaft and means for moving or adjusting the position of said element or shaft. As is known and well understood, the

control means 5 of the present example may be moved to any desired position of adjustment corresponding to a desired station or signal, by manual operation of the control knob 8, the adjustment being determined and visibly indicated by the position of the dial 10 with respect to the indicator 11.

A present preferred form of automatic stopping means is shown and described herein in connection with the invention. In accordance with this system there are mounted upon, or connected with the control shaft 6, a plurality of disc-like cam members 13 each of which is provided on its periphery with a cam surface 14 located between two surfaces 15 and 16 of differing radii or levels By this means each cam or disc is arranged to actuate a reversing contactor or switch 17 for a driving motor 18, the arrangement being such that the motor is de-energized and stopped when the contactor is moved to a neutral position by the cam surface 14 engaging an operating member 19 of the contactor as indicated in connection with the first or extreme left hand contactor and cam member shown in the drawing.

Each contactor is provided by a flexible spring strip of conducting material secured to a supporting bar 20 of insulating material and having a free end which moves between spaced contacts 21 and 22 carried by other supporting means. For convenience of manufacture and to provide a connection between them, the contacts of the one and of the remaining contactors associated with the other cams, are carried by supporting means of conducting material arranged in parallel spaced relation in the form of flat strips 23, while the flexible arms, or moving contacts are carried by the same insulating and supporting means, or bar 20. All of the contact strips or arms are arranged in tangential relation respectively to the cams or discs with which they cooperate and by the spring action of each arm, the cam followers 19 are urged or biased to move in the direction of the cam surfaces whereby they follow the cam surfaces as the cams are rotated by operation of the control shaft 6.

The motor 18 is connected with the control shaft 6 to rotate it through a suitable driving connection, represented in the present example by a gearing 24. This is a reduction gearing whereby the motor may operate at normal speed while the tuning control means 5 and the control shaft 6 are moved, thereby, at a slow rate of speed suitable for a tuning control of an apparatus of this character.

It will be seen that, as the motor is operated to rotate the control shaft, the cam members 13, being mounted thereon, will be moved with it and when a cam surface 14 comes into engagement with a contactor operating means 19, the corresponding contactor will be moved from a closed position to an open or neutral position substantially as shown in connection with the first (left hand) contactor in Fig. 1. The contacts 21 and 22 are then so adjusted that, with the cam surface 14 exactly engaging the operating means 19 for the contactor, the contactor bar is midway between contacts 21 and 22 and slightly out of contact with them.

The motor 18 is so connected with the reversing contacts 21 and 22 that when a contactor is closed with a contact 22 the control shaft 6 is moved by the operation of the motor in a clockwise direction as viewed in Fig. 1, and in the opposite direction when the contactor is closed with contact 21. Thus when the motor is energized through closure of a contact in either direction, the control shaft is moved in a direction to carry the cam associated with that contactor directly toward the neutral or open position, and the pre-selected or pre-determined position of adjustment of the tuning control means.

It will thus be seen that, by adjusting the tuning control means 5 or the control shaft 6 to a desired position of adjustment, such as by manual operation of the control knob 8, and by then adjusting a cam 13 corresponding to one of the contactors 17, whereby the latter is moved to its open or neutral position, the motor means may thereafter be employed to move the tuning control shaft to the same pre-determined or pre-selected position of adjustment, by energizing the motor means through that contactor. By providing a number of such contactors and operating means therefor, in connection with the control shaft, the latter may be moved to a corresponding number of pre-selected positions of adjustment, the desired position being selected by energizing the motor through a selected one of the contactors corresponding to the desired position.

The motor operating circuit is energized through the desired contactor by means of suitable push-button selector switches indicated at 25. The operation of the pre-selector tuning system of the present example will be better understood with reference to the circuit diagram shown in Fig. 2, in which like parts are provided with the same reference numerals.

The connection for the driving motor 18 with the tuning control means 5, and the manual operating knob 8 is indicated by a dotted line connection 26 which passes through the contactors 17 to indicate that they are also operated by the motor 18 in accordance with the construction shown in Fig. 1. The reversing contacts are indicated at 21 and 22 for each contactor. It will be noted that the contactors, except for the first or left hand contactor in the diagram, are in the closed position in one direction or the other as is the case in ordinary operation. This is for the reason that each contactor is moved to its open position only as its cam surface comes into operation at the different pre-selected positions of adjustment as above described.

The motor may be of any suitable type provided with reversing leads 27 which are connected with the terminal strips 23 for the contactors. Each contactor is provided with a selector lead 28 which is connected through one of the selector switches 25, with a common return lead 29 leading to a suitable supply source. In the present example it is arranged for A. C. operation from a supply transformer 30 which is energized from suitable supply mains 30'. The transformer 30 is connected to the motor through a second lead 31 which as indicated, leads through the motor to the reversing leads 27. Selection of one or the other of the reversing leads 27 by the position of the contactors 17, determines the direction of rotation of the motor toward the neutral or stop position, and the contactor selected for that position is determined by closure of one of the switches 25 corresponding to that contactor, thereby completing a motor operating circuit through leads 31, 27, 28 and 29. A plurality of extension circuits, for remote control by additional switches (not shown) may be provided by a suitable cable connection as indicated at 32.

As is obvious, the operating cams or discs 13 are secured to the control shaft whereby they may

move with it and, when properly adjusted they will cause the contactors 17 to open and stop the operation of adjusting the control means at desired points. It is also obvious that any given adjustment, or any one pre-determined position of adjustment, for example one for a pre-selected station should not necessarily be permanent and it may be and often is desirable and expedient that it be changed. It is also desirable that the adjusting means and the selector means, or switch, for each contactor be associated together and arranged for convenient operation from a central point such as the panel front of the receiver.

Accordingly, the cam members are each connected with the shaft 6 by a frictional connection or clutch means provided between it and the shaft. In the present example the clutch means is located in a hub member 33 integral with the cam or disc. The hub is grooved about its periphery to receive a garter spring or band 34 which engages the ends of a plurality of spaced plungers or plugs 35 located radially in the hub member 33. The plugs or plungers are biased by the spring 34 to move radially inwardly into frictional engagement with the shaft, thereby providing the frictional connection between the cam and the shaft.

The force applied by the spring or band 34, and the number of plungers is such that the cams are securely held on the shaft against rotation, with respect to it, when operating the contactors. The plungers may be of any suitable material such as aluminum or leather, adapted to provide a good frictional contact with the shaft, and are preferably cylindrical in form and slidably mounted in the hub, but without looseness or play.

The cam members are thus adapted to be adjusted relative to the tuning control means 5 and the control shaft 6, by being held against rotation while the shaft 6 is caused to be rotated by operation of the control knob 8. The adjustment is effected by holding the cam member for which an adjustment is to be made, in a fixed position, wherein the cam surface 14 holds the corresponding contactor 17 in the open position, when the control knob 8 is operated to move the control means 5 to the desired position of adjustment, whereupon the cam member is released to operate in connection with the control shaft.

As a preferred holding means for each cam, a notch or seat 36 is provided in the cam member in which the end of a movable plunger 37 is arranged to seat. The plungers 37 are slidably mounted in a supporting block or bracket 38 having a panel face 39 from which the opposite ends of the plungers project to provide a row of push buttons. The plungers are normally held in retracted positions away from the notches 36, and in a projecting position with respect to the panel face 39 by resilient flat leaf springs 40 secured to the block 38.

The notches or seats in the cams are provided in any suitable manner, and together with the plungers, represent any suitable means for releasably engaging and holding the cam members against movement when adjusting the position of the control member 5. In the present example, the notches or seats 36 are provided in axially extending thin flanges 41 provided integral with the body of each cam member, the flanges being preferably of lesser diameter than the cam members. The notches are located at points diametrically opposite to the positions of the cam surfaces 14 on each cam member, whereby the contactors 17 and the plungers 37 may be located at diametrically opposite sides of the control shaft, as is a convenient arrangement for manufacture and adjustment.

It will be noted that the flanges 41 provided on the cam members lie between the peripheries of the cams and the clutch means provided in the hubs of the cam members, and extending from the same side of the cam members, provide a housing or protective covering for the clutch means.

In the present example, the switches 25 are carried by a common insulating strip 42 and include a contact bar 43 mounted upon the strip and spring contact members 44 arranged to contact therewith under the action of plungers or push buttons 45 mounted in the bracket 38 and arranged to project from the panel 39 in a row, as indicated.

In the preferred arrangement of the operating means which include the setting buttons 37 and the selector buttons 45, are arranged in spaced parallel rows upon the face 39 of the supporting bracket or block 38. In the present example the spaced parallel rows of plungers or buttons are arranged horizontally and spaced apart a sufficient distance to permit an indicator card 46 to be located between each pair of plungers or buttons corresponding to each contactor, or each position of adjustment provided by the automatic tuning means. In the present example the card 46 is located in a holder 47 providing a channel into which the cards 46 are pressed in the form of a strip. The cards are for the purpose of registering station indications and the like, to indicate the channel or station to be selected by operation of the selector buttons 45.

It will be seen that this arrangement of the control means provides a compact control unit having a panel face 39 from which project two rows of buttons and between which lies an indicator card. The panel 39 is arranged to lie behind the panel 7 of the apparatus and to present the control buttons upon the face of the panel 7 through a suitable opening surrounding said control elements or buttons, similar to that provided for the indicator window 12, but not shown for the sake of simplifying the drawing.

The operation is as follows:

The motor is operated by closing one of the selector switches 25 by depressing one of the control buttons 45 corresponding thereto. The button is held depressed and the switch is thereby held closed until the motor 18 has caused the control shaft 6 to carry the cam member 13 corresponding to that button, into the position shown in Fig. 1 for the first or left hand cam member, wherein the latter causes the corresponding contactor 17 to be moved to its open position as shown, thereby stopping the motor and the movement of the control shaft 6. This operation brings the retaining notch or opening 36 in the cam member, opposite the end of the setting plunger or button 37 which is then pressed in to lock the cam in a fixed position, with the contactor open.

With the plunger held in, the control shaft is then moved to carry the tuning control means 5 to a position of adjustment wherein a desired station is tuned in. This is effected in the present example by operation of the control knob 8. When an exact desired position of adjustment is thus obtained, the setting button 37 is released and the cam is then in a position of adjustment

to stop the tuning control shaft automatically thereafter at that same position. For example, should the tuning control means be adjusted to another position it will be seen that by closing the selector switch 25 above referred to, for the adjusted position, the cam member 13 will open the contactor 17 at the same setting as before.

The remaining cams are adjusted in a similar manner for other desired positions of adjustment of the tuning means, and when all are adjusted, further operation of the setting button 37 is unnecessary. The various pre-selected stations may then be tuned in automatically upon closure of one of the selector switches 25 corresponding to a selected one of them, through operation of the corresponding one of the selector buttons 45.

However, should a different adjustment of the tuning control means be desired for any one of the selector buttons 45, it is merely necessary to depress the selector button until the tuning operation stops, then depress the setting button associated with and directly below it, and while holding the setting button depressed, to adjust the tuning control means to the new position. Thereafter the selector button will operate to bring the tuning control means to the new position.

It will be appreciated that a selector means of this character having the features of adjustment and compact unitary construction as shown and described herein, is not limited to use in connection with a control shaft of a tuning means, but may be applied to other apparatus and control shafts which require frequent adjustment to pre-selected positions and a not infrequent change in such positions of adjustment.

It will also be appreciated that while I have shown and described my invention in its simplest and its present preferred form, it is not limited thereto but may be carried out by other means.

I claim as my invention:

1. The combination with an instrument control shaft and a reversible electric motor connected therewith, of a plurality of disc-like cam members mounted on said shaft in close spaced relation to each other, each of said cam members having a peripheral cam surface, a hub member through which the shaft passes, and an annular flange extending from one face axially between the periphery and the hub, a plurality of plungers carried by the hub and engaging the shaft radially, spring means for causing said plungers to engage said shaft, reversing contactor switches for the motor in operative connection with said cam surfaces, a combined bracket and panel member arranged in parallel relation to said cams substantially diametrically opposite to said contactors, a plurality of push button switches carried by said bracket and panel member providing a row of spaced selector buttons projecting from one face of said member, said switches being connected each in circuit with one of said contactor switches, a plurality of setting plungers mounted in said bracket and panel member in spaced substantially parallel relation to each other to provide at one end a row of spaced setting buttons in parallel spaced relation to said first row of buttons, said plungers being arranged to align and contact each with one of said flanges on the cam members, means providing a seat for said plungers in each of said flanges, and means for manually rotating said shaft.

2. In a tuning control system for radio receiving apparatus and the like, the combination with a reversible tuning motor, a plurality of reversing contactors for said motor, a plurality of operating cam members for said contactors and a control shaft connected with said motor and having said cam members mounted thereon, of means for adjusting said cam members with respect to said shaft comprising an individual switch for individually controlling said motor through each of said contactors, push button means for operating said switches, a hub for each of said cam members provided with resilient plunger means for frictionally engaging said shaft, a flange element concentric with said hub in spaced relation thereto having a notch substantially diametrically opposite to the cam surfaces, a plunger member associated with each of said switch operating buttons arranged to engage and lock in the notch in each of said cam members when the latter is moved by said motor means to open the contactor associated therewith, and a bracket member arranged to support said operating buttons and plunger members in alignment for operation as herein set forth, and means for manually adjusting said shaft.

3. In combination with an instrument control shaft, of means for electrically controlling said shaft whereby it is movable to a plurality of preselected positions of rotation, said means including a plurality of reversing switches, an electric motor controllable thereby and connected with said shaft, and a plurality of cams, one for operating each of said switches, each of said cams having a hub provided with plunger means for frictionally engaging the shaft, and a flange concentric with said hub, said flanges each having a notch, a plunger member arranged to engage each of said notches in locking engagement therewith following movement of the shaft to a predetermined position of rotation through energization of the motor means through the contactor controlled by the corresponding cam member, and means for independently rotating said shaft.

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