Jan. 28, 1941. R. A. BONHAM 2,229,634

ELECTRICAL TUNING MECHANISM FOR RADIOS

Filed Sept. 7, 1939 2 Sheets-Sheet 1

Fig. 1.

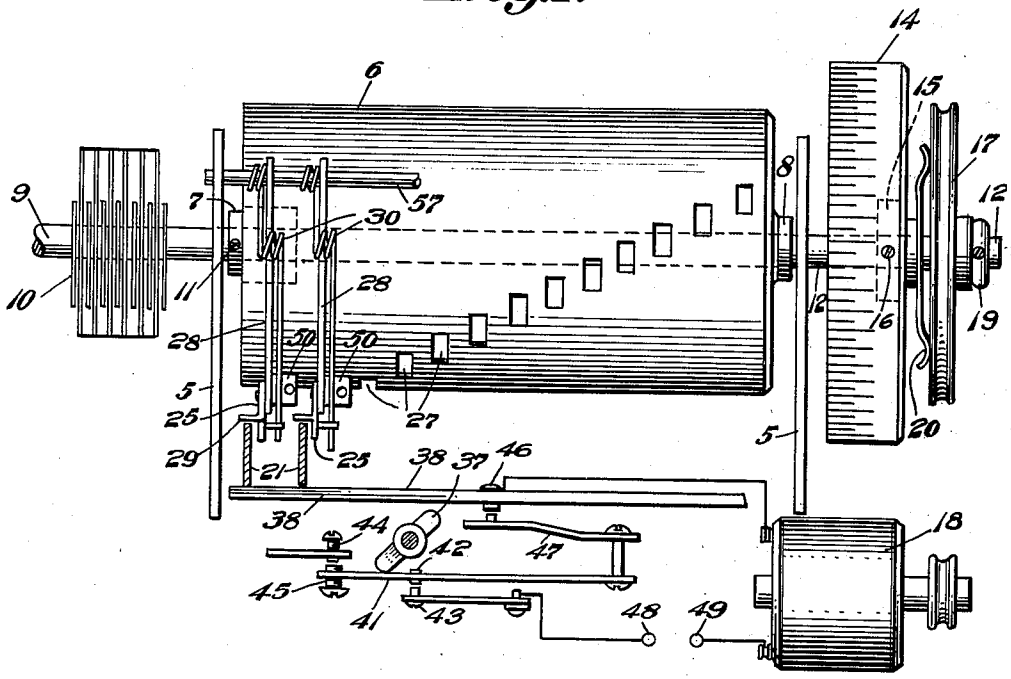
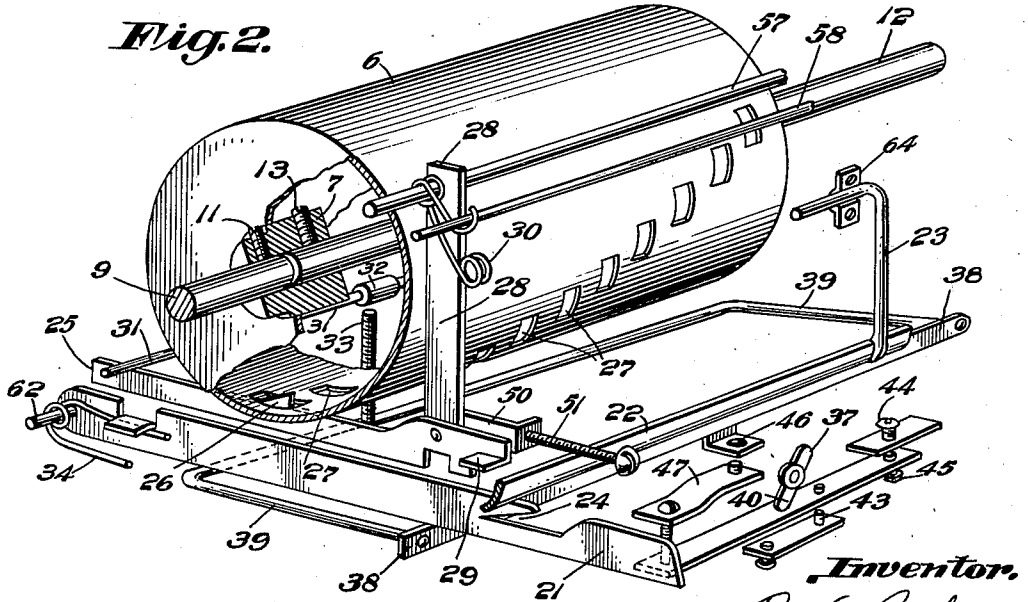



Fig. 2.




Inventor.

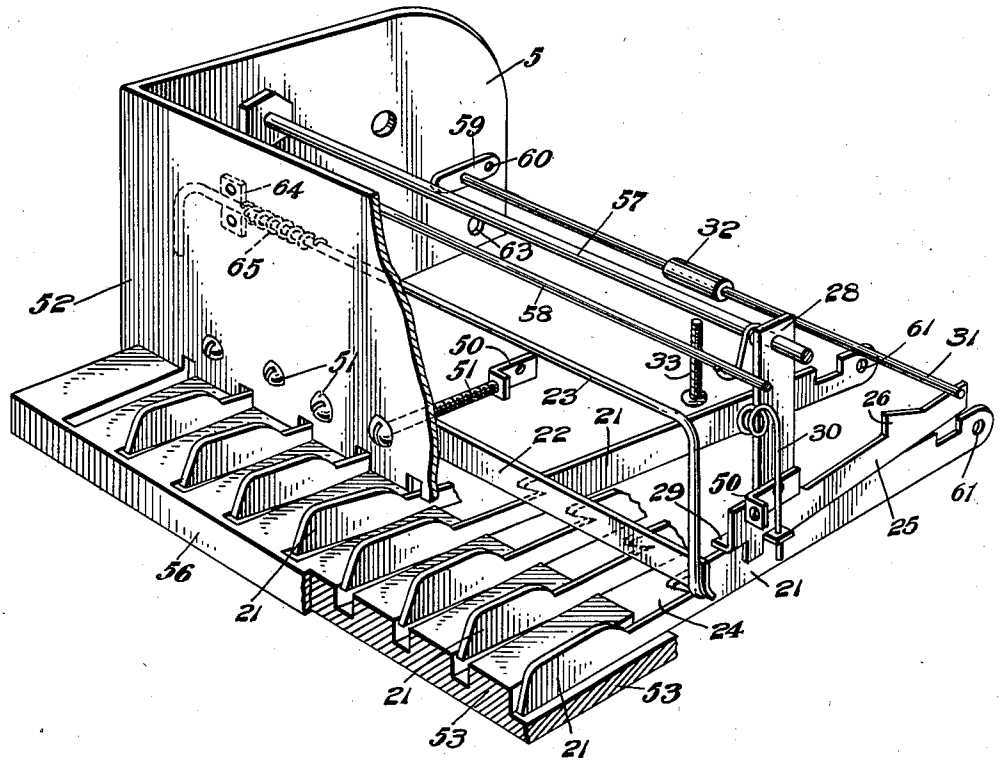
Roy A. Bonham

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ELECTRICAL TUNING MECHANISM FOR RADIOS

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*Fig. 3.*



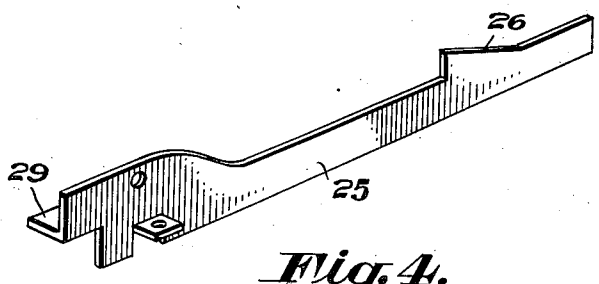




*Fig. 4.*

*Inventor.*

Roy A. Bonham

Patented Jan. 28, 1941

2,229,634

# UNITED STATES PATENT OFFICE

2,229,634

## ELECTRICAL TUNING MECHANISM FOR RADIOS

Roy A. Bonham, Springfield, Mo.

Application September 7, 1939, Serial No. 293,785

20 Claims. (Cl. 192—142)

This invention relates to electrical tuning mechanism for radios, and one object is to provide an improved and simplified construction whereby when one of a plurality of keys is depressed an electrical circuit through a motor will be closed and cause the motor to rotate a condenser gang to the desired broadcasting station frequency and at that point cause the circuit to open, and to hold the condenser gang in the exact position necessary for radio reception.

A further object is to provide positive and mechanical means for stopping the tuning condensers at the exact point for sharp tuning without the necessity of using automatic frequency control.

A still further object is to eliminate all mechanism or electrical switches that reverse the direction of rotation of the motor or the tuning condensers.

A still further object is to eliminate a multiplicity of electrical contacts that are subject to wear and adjustments or replacements.

A still further object is to provide for the possible use of tuning condensers that rotate in one direction and through the full range of 360 degrees but may cover the desired frequencies through a lesser number of degrees.

A still further object is to provide convenient means for adjusting from the front of the radio the mechanism that stops the tuning condensers at the proper position for exact instead of approximate resonance with the desired frequency, and to accomplish the same without complicated mechanism.

A still further object is to make and arrange the keys in such manner that a greater number of keys may be used without their occupying a large space on the front of the radio.

With the foregoing and other objects in view, the invention consists in the novel construction, combination and arrangement of elements hereinafter described and claimed.

In the drawings,

Figure 1 is a front view showing the tuning condenser, frequency cylinder, tuning scale, driving mechanism and relation to the motor position.

Figure 2 is a perspective drawing showing certain parts through cut-out sections and omission of multiple parts and other parts shown in the other drawings.

Figure 3 shows the key-board and a reverse view of parts shown in the other drawings, omitting multiple parts and parts shown in the other drawings.

Figure 4 is perspective view of one of the pawls that stops the cylinder and condenser gang at the proper position.

In carrying out my invention I provide a casing 5 of any suitable construction for supporting the various parts and mount therein a hollow cylinder 6 having a hub 7 at one end and a hub 8 at the other end. The condenser shaft 9 carrying rotor plates 10 is connected to the cylinder by a set-screw 11 in the hub 7 and both cylinder 6 and condenser shaft 9 are rotated together by shaft 12, one end of which is also secured in hub 7 by set-screw 13, the other end of the shaft 12 passing loosely through hub 8 and carrying a scale 14 which has a hub 15 secured to the shaft 12 by set-screw 16. Shaft 12 is caused to rotate when the sheave 17 is revolved by the motor 18. The sheave 17 is not secured rigidly to the shaft 12, but the hub of sheave 17 forms a friction clutch against boss 19 by means of spring 20, thus allowing the sheave or the cylinder to revolve independently of each other.

Means are provided for effecting rotation of the cylinder by either of two methods, each independently of the other, as follows: In Fig. 2 key 21, which is one of a plurality of keys, is shown depressed and in position for station reception. In this position lock-bar 22 supported by hinged yoke 23 has been caused to move out of slanting notch 24 and rest on the upper edge of key 21. Adjacent to key 21 is a pawl 25 having a tooth 26 under the cylinder 6 and in line with one of the apertures 27, the pawl being pivoted to support 28 and having a lug 29 projecting over key 21; when key 21 is depressed the lug 29 is caused to follow the key downward by action of spring 30, causing tooth 26 to move upward against cylinder 6 which revolves until aperture 27 moves over the tooth 26, the latter moving upward into the aperture. The pawl 25 extends beyond the tooth 26 and under a cross-bar 31 having an electrical contact element 32 insulated from cross-member 31, which, when not lifted by the pawl 25, makes contact with adjustable contact screw 33, closing the electrical circuit in the motor driving the cylinder. When the pawl 25 is permitted to move farther upward when tooth 26 enters aperture 27 the cross-bar 31 is lifted, thus separating contacts 32 and 33, breaking the electrical circuit in the motor until another key is depressed. The depressing of another key will cause lock-bar 22 to move backward and over the slanting notch 24 in the key already down and spring 34 at the pivoted end of key 21 will cause the key to be restored to its

non-depressed position; as it moves upward it raises lug 29 on pawl 25 causing the other end of the pawl to move away from the cylinder and permit cross-bar 31 and contact 32 to move against contact 33, again closing the electrical circuit in the motor, causing the cylinder 6 to again revolve. By the method described a key, when depressed, remains locked in a depressed position until another key is depressed. An alternative method of causing the cylinder 6 to revolve to the desired position is effected by a combination switch mechanism of suitable construction in which element 35 shown in Fig. 1 and Fig 2 is operated by a knob and shaft 36 shown in Fig. 3. Part 35 is a double-nosed cam, having nose 37 which raises bar 38 on yoke 39, limiting the downward movement of keys 21 enough to prevent lock-bar 22 from locking the keys down. Nose 40 moves against bar 41, closing electrical contacts 42 and 43 and opening electrical contacts 44 and 45. Contacts 44 and 45 are in series with contact 33, and, therefore, no electrical circuit can be effected through the driving motor unless contacts 44 and 45 are closed. With contacts 42 and 43 closed a new circuit through the motor is effected when any of the keys 21 are depressed against bar 38, causing contacts 46 and 47 to close. With a key 21 held down until tooth 26 enters one of the apertures 27 in the cylinder the motor continues to rotate the sheave 17 until the hand is removed from the depressed key which returns to its normal position and breaks the motor circuit by allowing contacts 46 and 47 to open. Connection points 48 and 49 are for the source of current for the motor. Contact 45 is insulated from the bar 41 and is connected with 48. Contact 44 is connected to contact 33. Contact 32 is connected with contact 46.

In construction one of the keys 21 may be provided with a contact switch under the key in such manner that when the key is depressed the contacts will be opened and the electrical supply to the radio cut off. The cam 25 associated with the key selected for such on-and-off switch would be eliminated. One of the keys 21 may also be used to allow for manual tuning by a knob suitably arranged to rotate the cylinder 6 and by eliminating the tooth 26 on the cam associated with the key so selected. With the tooth 26 eliminated the cam 25 would, when its associated key 21 is depressed, lift bar 31 and separate contacts 32 and 33, keeping the motor inactive during manual tuning. These features are not shown in the drawings.

In Fig. 2 support 28 has an angle 50 attached thereto and a threaded bolt 51 entering one leg of the angle 50, the bolt 51 passing through the panel 52 shown in Fig. 3. By turning the bolt 51 in one direction the angle 50, together with support 28 and the cam 25, will be drawn toward the panel 52. When the bolt 51 is turned in the opposite direction the cam 25 will be allowed to recede from the panel 52. Either adjustment of the bolt 51 changes the position of tooth 25 in its relation to the aperture 27, thus permitting the cylinder 6 to stop the tuning condenser to a more exact point for sharp tuning of the desired frequency, and when so adjusted the cylinder 6 and the tuning condensers will be stopped in exactly the same position each time the same key is depressed.

In Fig. 3 is shown the arrangement of the keys and the keyboard in relation to the case containing the tuning mechanism. 53 is a member constructed of wood or other suitable material, placed parallel and at right-angles to panel 52, and having grooves or recesses 54 into which the keys 21 recede when depressed. The keys 21 are made of thin material and are placed edge-wise in the grooves 54, with their flat sides parallel and facing each other. Between the keys 21 a tab 55 is quickly insertable or removable, one end of which is folded at right-angles over member 53 and under band 56.

In Fig. 3 rod 57 carries all of the supports 28 to which the cams 25 are attached, and also all of the springs 30 for actuating the cams, and is supported at each end by the casing 5. Rod 58 runs close to and parallel with rod 57 and is for the purpose of retaining one end of the springs 30, and is also supported at each end by casing 5. Part 59 attached to bar 31 is rigidly attached to the bar and is pivoted to the casing 5 by a bearing 60, which allows bar 31 to move upward or downward by the cam 25. Each end of bar 31 is anchored to the case 5 by part 59 and bearing 60. One end of each of the keys 21 has a hole 61 through which a rod 62 anchors them to the case 5 at holes 63. Yoke 23 is supported to panel 52 by bearings 64 and has a spring 65 to actuate the yoke and lock-bar 22 for locking down keys 21.

Fig. 4 shows more clearly the shape and construction of the cam 25.

What is claimed is:

1. In a device of the class described, a combination comprising a cylinder rotatable on and with a shaft, a tuning condenser attached to said shaft, the cylinder, shaft and tuning condenser rotatable through a circle of 360 degrees, means for rotating the cylinder, shaft and tuning condenser comprising a sheave or wheel driven from a motor, said sheave or wheel frictionally mounted on the shaft so that either the wheel or the shaft and cylinder may be rotated independently of each other, means for stopping the cylinder and condenser at various positions, said means comprising cams having projections thereon to engage apertures or recesses in the surface of the cylinder, keys for actuating the cams, a locking bar for retaining any key in a depressed position, a switch arrangement in the motor circuit comprising a bar transversely across the cams, an electrode on said bar to make contact with an electrode independent of the bar, said bar movable by and with the cams, a switch arrangement in the motor circuit comprising a bar movable by and with the keys, said bar having an electrode to make contact with another electrode when any key is depressed, a combination switch for selecting either the circuit through the switch actuated by the cams or the switch actuated by the keys.

2. In a device of the class described, a combination comprising a cylinder rotatable on and with a shaft, a tuning condenser attached to said shaft, the cylinder, shaft and tuning condenser rotatable through a circle of 360 degrees, means for rotating the cylinder, shaft and tuning condenser comprising a sheave or wheel driven from a motor, said sheave or wheel frictionally mounted on the shaft so that either the wheel or the shaft and cylinder may be rotated independently of each other, means for stopping the cylinder and condenser at various positions, said means comprising cams having projections thereon to engage apertures or recesses in the surface of the cylinder, keys for actuating the cams, a locking bar for retaining any key in a depressed position, a switch arrangement in the motor circuit com-

prising a bar transversely across the cams movable by and with the cams, said bar having an electrode to make contact with another electrode.

3. In a device of the class described, a combination comprising a cylinder rotatable on and with a shaft, a tuning condenser attached to said shaft, the cylinder, shaft and tuning condenser rotatable through a circle of 360 degrees, means for rotating the cylinder, shaft and tuning condenser comprising a sheave or wheel driven from a motor, said sheave or wheel frictionally mounted on the shaft so that either the wheel or the shaft and cylinder may be rotated independently of each other, means for stopping the cylinder and condenser at various positions, said means comprising cams having projections thereon to engage apertures or recesses in the surface of the cylinder, keys for actuating the cams, a switch arrangement for opening and closing the motor circuit comprising a bar movable by and with the keys, said bar having an electrode to make contact with another electrode when a key is held in a depressed position.

4. In a device of the class described, a motor-driven combination comprising a cylinder rotatable on and with a shaft, means on the shaft for attachment to a tuning condenser, a driven element frictionally mounted on the shaft so that either the driven element or the shaft and cylinder may be rotated independently of each other, cams provided with projections to engage apertures or recesses in the surface of the cylinder for stopping the cylinder at various positions, keys for actuating the cams, a locking bar for retaining any key in a depressed position, a switch arrangement in the motor circuit for starting and stopping the motor comprising a bar or rod movable by and with the cams, an electrode on said bar or rod to make contact with another electrode independent of the bar or rod, a switch arrangement in the motor circuit for starting or stopping the motor comprising a bar or rod movable by and with the keys, said bar or rod having an electrode to make contact with another electrode independent of the bar or rod when any key is depressed, a combination switch for selecting either the motor circuit through the switch actuated by the cams or the switch actuated by the keys.

5. In a device of the class described, a motor-driven combination comprising a cylinder rotatable on and with a shaft, means on the shaft for attachment to a tuning condenser, a driven element frictionally mounted on the shaft so that the driven element may rotate independently of the shaft or shaft and cylinder may rotate independently of the driven element, cams provided with projections to engage apertures or recesses in the surface of the cylinder for stopping the cylinder at various positions, keys for actuating the cams, a locking bar for retaining any key in a depressed position, a switch arrangement in the motor circuit for starting and stopping the motor comprising a bar or rod movable by and with the cams, a contact or electrode on said bar or rod to make contact with another contact or electrode independent of the bar or rod.

6. In a device of the class described, a motor-driven combination comprising a cylinder rotatable on and with a shaft, means on the shaft for attachment to a tuning condenser, a driven element frictionally mounted on the shaft so that the driven element may rotate independently of the shaft or the shaft and cylinder may rotate independently of the driven element, cams provided with projections to engage apertures or recesses in the surface of the cylinder for stopping the cylinder at various positions, keys for actuating the cams, a switch arrangement in the motor circuit for starting and stopping the motor comprising a bar or rod movable by the keys, said bar or rod having a contact or electrode to make contact with another contact or electrode independent of the bar or rod when a key is held in a depressed position.

7. In a device of the class described, a motor-driven combination comprising a cylinder having apertures or recesses at different positions on the surface thereof and rotatable on and with a shaft attached to a tuning condenser, a driven wheel on the shaft to rotate the shaft, cylinder and condenser, a clutch for the said driven wheel comprising a spring attached to the wheel so that the shaft will pass through both the wheel and the spring, a boss or collar rigidly attached to the shaft on one side of the wheel and a boss or collar rigidly attached to the shaft on the other side of the wheel, the combination of cylinder, shaft, condenser and wheel rotatable through a circle of 360 degrees, cams arranged transversely with the cylinder to co-incide with the apertures or recesses in the surface of the cylinder, projections on the cams to engage the apertures or recesses in the surface of the cylinder, means for adjusting the position of the cams to stop the cylinder at the desired position in its rotation, said adjustment comprising a threaded element or bolt through the front of the housing, one end of the bolt connecting with a threaded element on the cam in such manner that the turning of the bolt will move the cam to or from the housing, keys for actuating the cams, said keys comprised of thin flat pieces having a hole in one end, a shaft through the holes in the keys for retaining said keys in a position transverse to the cylinder, said keys mounted edge-wise to the cylinder with their flat sides parallel with each other, a slanting notch in keys, a locking bar resting in the slanting notches and parallel with the cylinder for retaining any key in a depressed position, a switch arrangement for opening and closing the motor circuit comprising a bar or rod parallel with the cylinder and transversely across the cams, said bar or rod terminating at each end in a crank-like formation and bearing to permit the bar or rod to move with the cams, a contact or electrode on said bar or rod to make contact with another contact or electrode independently of the bar, a switch arrangement for opening and closing the motor circuit comprising a bar or rod parallel with the cylinder and transversely across the cams, said bar or rod terminating at each end to a yoke supported in bearings to permit the bar or rod to move with the keys, a contact or electrode on said bar or rod to make contact with another contact or electrode independent of the bar or rod when a key is held in a depressed position, a switch arrangement for alternatively selecting either the motor circuit through the switch-bar operated by the cams or the switch-bar operated by the keys, said switch comprising a double-nosed cam mounted on a shaft in such manner that when turned in one direction one nose of the cam will limit the movement of the switch bar or rod operated by the keys and the other nose of the cam will open contact points in the circuit of the switch bar actuated by the cams controlling the cylinder and close contact points in the circuit of the switch-bar operated by the keys.

8. In a device of the class described, a motor-driven combination comprising a cylinder having

apertures or recesses at different positions on the surface thereof and rotatable on and with a shaft attached to a tuning condenser, a driven wheel on the shaft to rotate the shaft, cylinder and condenser, a clutch for the said driven wheel comprising a spring attached to the wheel so that the shaft will pass through both the wheel and the spring, a boss or collar rigidly attached to the shaft on one side of the wheel and a boss or collar rigidly attached to the shaft on the other side of the wheel, the combination of cylinder, shaft, condenser and wheel rotatable through a circle of 360 degrees, cams arranged transversely with the cylinder to co-incide with the apertures or recesses in the surface of the cylinder, projections on the cams to engage the apertures or recesses in the surface of the cylinder, means for adjusting the position of the cams to stop the cylinder at the desired position in its rotation, said adjustment comprising a threaded element or bolt through the front of the housing, one end of the bolt connecting with a threaded element on the cam in such manner that the turning of the bolt will move the cam to or from the housing, keys for actuating the cams, said keys comprised of thin flat pieces having a hole in one end, a shaft through the holes in the keys for retaining said keys in a position transverse to the cylinder, said keys mounted edge-wise to the cylinder with their flat sides parallel with each other, a slanting notch in keys, a locking bar resting in the slanting notches and parallel with the cylinder for retaining any key in a depressed position, a switch arrangement for opening and closing the motor circuit comprising a bar or rod parallel with the cylinder and transversely across the cams, said bar or rod terminating at each end in a crank-like formation and bearing to permit the bar or rod to move with the cams, a contact or electrode on said bar or rod to make contact with another contact or electrode independent of the bar.

9. In a device of the class described, a motor-driven combination comprising a cylinder having apertures or recesses at different positions on the surface thereof and rotatable on and with a shaft attached to a tuning condenser, a driven wheel on the shaft to rotate the shaft, cylinder and condenser, a clutch for the said driven wheel comprising a spring attached to the wheel so that the shaft will pass through both the wheel and the spring, a boss or collar rigidly attached to the shaft on one side of the wheel and a boss or collar rigidly attached to the shaft on the other side of the wheel, the combination of cylinder, shaft, condenser and wheel rotatable through a circle of 360 degrees, cams arranged transversely with the cylinder to co-incide with the apertures or recesses in the surface of the cylinder, projections on the cams to engage the apertures or recesses in the surface of the cylinder, means for adjusting the position of the cams to stop the cylinder at the desired position in its rotation, said adjustment comprising a threaded element or bolt through the front of the housing, one end of the bolt connecting with a threaded element on the cam in such manner that the turning of the bolt will move the cam to or from the housing, keys for actuating the cams, said keys comprised of thin flat pieces having a hole in one end, a shaft through the holes in the keys for retaining said keys in a position transverse to the cylinder, said keys mounted edge-wise to the cylinder with their flat sides parallel with each other, a switch arrangement for opening and closing the motor circuit comprising a bar or rod parallel with the cylinder and transversely across the keys, said bar or rod terminating at each end to a yoke supported in bearings to permit the bar or rod to move with the keys, a contact or electrode on said bar or rod to make contact with another contact or electrode independent of the bar or rod when a key is held in a depressed position.

10. In a device of the class described, a motor-driven combination comprising a cylinder having apertures or recesses at different positions on the surface thereof and rotatable on and with a shaft, a frictionally mounted element on the shaft for attachment to a motor, means for stopping the cylinder at various positions in its rotation comprising cams each having a tooth or projection at one end for engaging the apertures or recesses in the surface of the cylinder when a key is depressed, means for shifting said cams to allow the cylinder to stop at a more exact point comprising a threaded bolt through the housing parallel with the cylinder and in position to be accessible from the front or key-board side, the threaded bolt connecting with a threaded element on the cam, keys for actuating the cams, said keys comprised of thin flat pieces transverse with the cylinder and pivoted at one end and having the other end project from the housing, said keys mounted edge-wise to the cylinder and having their flat sides facing and parallel with each other, means for retaining the keys in a depressed or locked position comprising a bar transversely across one edge of the keys and resting in a slanting notch in each of the keys, said bar being attached at each end to a yoke having bearings to allow the bar to swing against one side of the slanting notches in the keys, a switch arrangement for the motor circuit comprising a bar or rod parallel with the cylinder and transversely across the cams, said bar or rod anchored at each end to a movable support in such manner that the bar or rod will move with the cams, a contact or electrode on said bar or rod to make contact with another contact or electrode independent of the bar or rod when a key is depressed, a switch arrangement for the motor circuit comprising a bar parallel with the cylinder and transversely across the keys, said bar attached at each end to a yoke having bearings to allow said bar to move when a key is depressed against it, said bar having a contact or electrode to make contact with another contact or electrode independent of the bar when a key is depressed against the bar, a switch arrangement for selecting either of the motor circuits comprising a cam mounted on a shaft to open or close contacts in the motor circuit selected.

11. In a device of the class described, a motor-driven combination comprising a cylinder having apertures or recesses at different positions on the surface thereof and rotatable on and with a shaft, a frictionally mounted element on the shaft for attachment to a motor, means for stopping the cylinder at various positions in its rotation comprising cams each having a tooth or projection at one end for engaging the apertures or recesses in the surface of the cylinder when a key is depressed, means for shifting said cams to allow the cylinder to stop at a more exact point comprising a threaded bolt through the housing parallel with the cylinder and in position to be accessible from the front or key-board side, the threaded bolt connecting with a threaded element on the cam, keys for actuating the cams, said keys comprised of thin flat pieces transverse

with the cylinder and pivoted at one end and having the other end project from the housing, said keys mounted edge-wise to the cylinder and having their flat sides facing and parallel with each other, means for retaining the keys in a depressed or locked position comprising a bar transversely across the keys, said bar being attached at each end to a yoke having bearings to allow the bar to swing, notches in the keys for the lock-bar to rest in, a switch arrangement for the motor circuit comprising a bar or rod transversely across the cams, said bar or rod anchored at each end to a movable support in such manner that the bar or rod will move with the cams, a contact or electrode on said bar or rod to make contact with another contact or electrode independent of the bar or rod when a key is depressed.

12. In a device of the class described, a motor-driven combination comprising a cylinder having apertures or recesses at different positions on the surface thereof and rotatable on and with a shaft, a frictionally mounted element on the shaft for attachment to a motor, means for stopping the cylinder at various positions in its rotation comprising cams each having a tooth or projection at one end for engaging the apertures or recesses in the surface of the cylinder when a key is depressed, means for shifting said cams to allow the cylinder to stop at a more exact point comprising a threaded bolt through the housing parallel with the cylinder and in position to be accessible from the front or key-board side, the threaded bolt connecting with a threaded element on the cam, keys for actuating the cams, said keys comprised of thin flat pieces transverse with the cylinder and pivoted at one end and having the other end project from the housing, said keys mounted edge-wise to the cylinder and having their flat sides facing and parallel with each other, means for closing the motor circuit said means comprising a bar transversely across the keys and attached at each end to a movable support so that the entire bar will move when a key is depressed against it, said bar having a contact or electrode thereon to make contact with another contact or electrode independent of the bar when a key is held in a depressed position against said bar.

13. In a device of the class described, a motor-driven combination comprising a cylinder having recesses or apertures at different positions on the surface thereof, rotatable on and with a shaft, means on the shaft for attachment to a tuning condenser, a driven element for rotating the shaft and cylinder said driven element being frictionally mounted on the shaft so that it may revolve independently of the shaft and cylinder or the shaft and cylinder rotated independently of the driven element, said means comprising a sheave or wheel loosely mounted on the shaft between two bosses or collars rigidly attached to the shaft and having a spring between one of the bosses or collars and the sheave or wheel, the combination of cylinder, shaft and driven element rotatable through a circle of 360 degrees, means for stopping the cylinder at various positions in its rotation said means comprising cams arranged transversely with the cylinder to coincide with the recesses or apertures in the surface of the cylinder, projections on the cams to engage the recesses or apertures in the surface of the cylinder, means for adjusting the position of the cams to stop the cylinder at the desired position in its rotation, said adjustment comprising a threaded element or bolt through the front of the housing, one end of the bolt connecting with a threaded element on the cam in such manner that the turning of the bolt will move the cam to or from the housing, keys for actuating the cams, said keys comprised of thin flat pieces having a hole in one end, a shaft through the holes in the keys for retaining said keys in a position transverse to the cylinder, said keys mounted edge-wise to the cylinder with their flat sides parallel with each other, a slanting notch in the keys, a locking-bar resting in the slanting notches and parallel with the cylinder for retaining any key in a depressed position, a switch arrangement for opening and closing the motor circuit comprising a bar parallel with the cylinder and transversely across the cams, said bar terminating at each end in a crank-like formation and a bearing to permit the bar to move with the cams, a contact or electrode on said bar to make contact with another contact or electrode independent of the bar, a switch arrangement for opening and closing the motor circuit comprising a bar parallel with the cylinder and transversely across the keys, said bar terminating at each end to a yoke supported in bearings to permit the bar to move with the keys, a contact or electrode on said bar to make contact with another contact or electrode independent of the bar when a key is held in a depressed position, a switch arrangement for alternatively selecting either the motor circuit through the switch-bar operated by the cams or the switch-bar operated by the keys, said switch comprising a double-nosed cam mounted on a shaft in such manner that when turned in one direction one nose of the cam will limit the movement of the switch-bar operated by the keys and the other nose of the cam will open contact points in the circuit of the switch-bar actuated by the cams controlling the cylinder and close contact points in the circuit of the switch-bar operated by the keys.

14. In a device of the class described, a motor-driven combination comprising a cylinder having recesses or apertures at different positions on the surface thereof, rotatable on and with a shaft, means on the shaft for attachment to a tuning condenser, a driven element for rotating the shaft and cylinder said driven element being frictionally mounted on the shaft so that it may revolve independently of the shaft and cylinder or the shaft and cylinder rotated independently of the driven element, said means comprising a sheave or wheel loosely mounted on the shaft between two bosses or collars rigidly attached to the shaft and having a spring between one of the bosses or collars and the sheave or wheel, the combination of cylinder, shaft and driven element rotatable through a circle of 360 degrees, means for stopping the cylinder at various positions in its rotation said means comprising cams transversely with the cylinder to coincide with the recesses or apertures in the surface of the cylinder, projections on the cams to engage the recesses or apertures in the surface of the cylinder, means for adjusting the position of the cams to stop the cylinder at the desired position in its rotation, said adjustment comprising a threaded element or bolt through the front of the housing, one end of the bolt connecting with a threaded element on the cam in such manner that the turning of the bolt will move the cam to or from the housing, keys for actuating the cams, said keys comprised of thin flat pieces having a hole in one end, a shaft through the holes

in the keys for retaining said keys in a position transverse to the cylinder, said keys mounted edge-wise to the cylinder with their flat sides parallel with each other, a slanting notch in the keys, a locking-bar resting in the slanting notches and parallel with the cylinder for retaining any key in a depressed position, a switch arrangement for opening and closing the motor circuit comprising a bar parallel with the cylinder and transversely across the cams, said bar terminating at each end in a crank-like formation and a bearing to permit the bar to move with the cams, a contact or electrode on said bar to make contact with another contact or electrode independent of the bar.

15. In a device of the class described, a motor-driven combination comprising a cylinder having recesses or apertures at different positions on the surface thereof, rotatable on and with a shaft, means on the shaft for attachment to a tuning condenser, a driven element for rotating the shaft and cylinder said driven element being frictionally mounted on the shaft so that it may revolve independently of the shaft and cylinder or the shaft and cylinder rotated independently of the driven element, said means comprising a sheave or wheel loosely mounted on the shaft between two bosses or collars rigidly attached to the shaft and having a spring between one of the bosses or collars and the sheave or wheel, the combination of cylinder, shaft and driven element rotatable through a circle of 360 degrees, means for stopping the cylinder at various positions in its rotation said means comprising cams arranged transversely with the cylinder to coincide with the recesses or apertures in the surface of the cylinder, projections on the cams to engage the recesses or apertures in the surface of the cylinder, means for adjusting the position of the cams to stop the cylinder at the desired position in its rotation, said adjustment comprising a threaded element or bolt through the front of the housing, one end of the bolt connecting with a threaded element on the cam in such manner that the turning of the bolt will move the cam to or from the housing, keys for actuating the cams, said keys comprising thin flat pieces having a hole in one end, a shaft through the holes in the keys for retaining said keys in a position transverse to the cylinder, said keys mounted edge-wise to the cylinder with their flat sides parallel with each other, a switch arrangement for opening and closing the motor circuit comprising a bar parallel with the cylinder and transversely across the keys, said bar terminating at each end to a yoke supported in bearings to permit the bar to move with the keys, a contact or electrode on said bar to make contact with another contact or electrode independent of the bar when a key is held in a depressed position.

16. In a device of the class described, a motor-driven combination comprising a cylinder having recesses or apertures at different positions on the surface thereof, rotatable on and with a shaft attachable to a tuning condenser, a driven element for rotating the shaft and cylinder said driven element comprising a sheave or wheel loosely mounted on the shaft between two bosses or collars rigidly attached to the shaft and having a spring between one of the bosses or collars and the sheave or wheel, means for stopping the cylinder at various positions in its rotation comprising cams separately pivoted near one end to supports in such manner that the free end of the cam will be free to move toward or from the cylinder, a tooth near the free end of the cam to engage its respective recess or aperture in the surface of the cylinder, the free end of the cam to have an extension beyond the tooth, a bar or rod transverse with the free ends of the cams and parallel with the length of the cylinder and hinged at each end in such manner that the projection on the free end of the cam beyond the tooth will move said bar when the tooth of said cam enters its recess or aperture in the surface of the cylinder, said bar or rod having a contact or electrode thereon to make contact with another contact or electrode independent of the bar or rod, a lug or projection on the pivoted end of the cam said lug or projection extending over one edge of a key-bar associated with the cam, the edge of said key-bar caused to press against the lug or projection on the cam by a spring on the key-bar, a spring for each key-bar, a spring on each cam support for holding the cams against the cylinder when a key is depressed, keys for actuating the combination comprising thin flat pieces pivoted at one end and having their flat sides facing and parallel with each other and with the other ends of said keys protruding from the front of the housing, a key-board at the front of the housing and parallel with the length of the cylinder, said key-board having slots for the keys to recede into when depressed, means for locking the keys in a depressed position comprising a slanting notch in each key and a bar resting in said notches, said bar attached at each end to a movable support and in such manner that when a key is depressed the slant of one side of the notch will move said bar, a bar or rod transverse with the keys and parallel with the cylinder and attached at each end to a movable support to allow said bar to move when a key is depressed against it, said bar having a contact or electrode thereon to make contact with another contact independent of said bar or rod when a key is held in a depressed position, an alternative switch arrangement for selecting the motor circuit through the switch operated by the free ends of the cams or the switch operated by the keys comprising a double-nosed cam mounted on a shaft in such manner that when the shaft is turned in one direction one end of the nose of the cam will limit the movement of the switch-bar operated by the keys and the other end of said cam will change the position of a contact spring closing one circuit of the motor and opening the other circuit of the motor, means for adjusting the exact stopping position of the cylinder, said means comprising threaded members or bolts through the housing and above the key-board and connecting with threaded elements at the pivoted ends of the cams in such position that the turning of the bolts will move the cams to or from the key-board.

17. In a device of the class described, a motor-driven combination comprising a cylinder having recesses or apertures at different positions on the surface thereof, rotatable on and with a shaft attachable to a tuning condenser, a driven element for rotating the shaft and cylinder said driven element comprising a sheave or wheel loosely mounted on the shaft between two bosses or collars rigidly attached to the shaft and having a spring between one of the bosses or collars and the sheave or wheel, means for stopping the cylinder at various positions in its rotation comprising cams separately pivoted near one end to supports in such manner that the free end of the

cam will be free to move toward or from the cylinder, a tooth near the free end of the cam to engage its respective recess or aperture in the surface of the cylinder, the free end of the cam to have an extension beyond the tooth, a bar or rod transverse with the free ends of the cams and parallel with the length of the cylinder and hinged at each end in such manner that the projection on the free end of the cam beyond the tooth will move said bar when the tooth of said cam enters its recess or aperture in the surface of the cylinder, said bar or rod having a contact or electrode thereon to make contact with another contact or electrode independent of the bar or rod, a lug or projection on the pivoted end of the cam said lug or projection extending over one edge of a key-bar associated with the cam, the edge of said key-bar caused to press against the lug or projection on the cam by a spring on the key-bar, a spring for each key-bar, a spring on each cam support for holding the cams against the cylinder when a key is depressed, keys for actuating the combination comprising thin flat pieces pivoted at one end and having their flat sides facing and parallel with each other and with the other ends of said keys protruding from the front of the housing, a key-board at the front of the housing and parallel with the length of the cylinder, said key-board having slots for the keys to recede into when depressed, means for locking the keys in a depressed position comprising a slanting notch in each key and a bar resting in said notches, said bar attached at each end to a movable support and in such manner that when a key is depressed the slant of one side of the notch will move said bar, the said bar being in the notches of all keys not depressed but resting on one edge of a key depressed and near the slanting side of the notch.

18. In a device of the class described, a motor-driven combination comprising a cylinder having recesses or apertures at different positions on the surface thereof, rotatable on and with a shaft attachable to a tuning condenser, a driven element for rotating the shaft and cylinder said driven element comprising a sheave or wheel loosely mounted on the shaft between two bosses or collars rigidly attached to the shaft and having a spring between one of the bosses or collars and the sheave or wheel, means for stopping the cylinder at various positions in its rotation comprising cams separately pivoted near one end to supports in such manner that the free end of the cam will be free to move toward or from the cylinder, a tooth near the free end of the cam to engage its recess or aperture in the surface of the cylinder, a lug or projection on the pivoted end of the cam said lug or projection extending over one edge of a key-bar associated with the cam, the edge of said key-bar caused to press against the lug or projection on the cam by a spring on the key-bar, a spring for each key-bar, a spring for each cam support for holding the cams against the cylinder when a key is depressed, keys for actuating the combination comprising thin flat pieces pivoted at one end and having their flat sides facing and parallel with each other and with the other ends of said keys protruding from the front of the housing, a key-board at the front of the housing and parallel with the length of the cylinder, said key-board having slots for the keys to recede into when depressed, means for adjusting the cams to stop the cylinder at a more exact point comprising a threaded element or bolt for each cam, said bolts passing through holes in the housing in position convenient at the key-board and connecting with a threaded element at the pivoted end of each cam, means for closing the motor circuit comprising a bar transverse with the keys and attached at each end to a movable support in such manner that the entire bar will move when any key is depressed against it, a contact or electrode on said bar to make contact with another contact or electrode independent of the bar when a key is held in a depressed position, said contacts separating and breaking the motor circuit when a depressed key is released.

19. In a device of the class described, a motor-driven combination comprising a cylinder having projections at various positions on the surface thereof, rotatable on and with a shaft, a tuning condenser attached to the shaft, a driven element for rotating the shaft cylinder and condenser through a circle of 360 degrees, said driven element comprising a sheave or wheel loosely mounted on the shaft between two bosses or collars rigidly attached to the shaft and having a spring between one of the bosses or collars and the sheave or wheel, means for stopping the cylinder and condenser at various positions in their rotation comprising cams separately pivoted near one end to supports in such manner that the free end of the cam will be free to move toward the cylinder, a projection near the free end of the cam to engage a projection on the surface of the cylinder, a lug or projection on the pivoted end of the cam said lug or projection extending over one edge of a key-bar associated with the cam, the edge of said key-bar caused to press against the lug or projection on the pivoted end of the cam by a spring on the key-bar, a spring for each key-bar, a spring for each cam support for causing the cams to move toward the cylinder when a key is depressed, key-bars or keys for actuating the combination comprising thin flat pieces pivoted at one end and having their flat sides parallel and facing each other and with the other ends of said key-bars or keys protruding from the front of the housing, a key-board at the front of the housing and parallel with the length of the cylinder, said key-board having slots therein for the keys to recede into when depressed, means for adjusting the cams to stop the cylinder at a more exact position comprising a threaded element or bolt for each cam, said bolts passing through a support at the key-board and connecting with a threaded element at the pivoted end of each cam, means for closing the motor circuit comprising a bar transverse with the keys and attached at each end to a movable support in such manner that the entire bar will move when any key is depressed against it, a contact or electrode on said bar to make contact with another contact or electrode independent of the bar when a key is depressed against it.

20. In a device of the class described, a combination comprising a cylinder having projections at various positions on the surface thereof, rotatable on and with a shaft and attachable to a tuning condenser, means for rotating the shaft and cylinder comprising a sheave or wheel frictionally mounted on the shaft so that the sheave or wheel may revolve independently of the shaft and cylinder or the shaft and cylinder be rotated independently of the sheave or wheel, means for stopping the cylinder at various positions in its rotation comprising cams separately pivoted near one end to supports in such manner that the cams will be free at one end to move toward or

from the cylinder, a lug or projection near the free end of each cam to engage the projections on the surface of the cylinder, key-bars or keys for actuating the cams, said key-bars or keys comprising thin flat pieces pivoted at one end and having their flat sides facing and parallel with each other and with ther free ends protruding through the housing of the mechanism and terminating in a key-board, a key-board parallel with the cylinder and having slots into which the key-bars or keys recede when depressed, means for adjusting the cams to cause the cylinder to stop at a more exact position comprising a threaded element or bolt for each cam, said bolts passing through a support at the key-board and connecting with a threaded element at the pivoted end of each cam, means for closing the motor circuit for setting the cylinder in motion comprising a bar transverse with the key-bars or keys and attached at each end to a movable support in such manner that the entire bar will move when any key is depressed against it, a contact or electrode on said bar to make contact with another contact or electrode independent of the bar when a key is depressed against the bar.

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